This file is available for free download at http://www.iluvmyrx7.com

This file is fully text-searchable – select Edit and Find and type in what you're looking for. This file is intended more for online viewing than printing out so some graphics may not print 100% legibly, you can zoom in on them if you need to.

www.iluvmyrx7.com

COOLING SYSTEM SPECIFICATIONS
Article Text
1993 Mazda RX7
For www.iluvmyrx7.com

Sunday, August 19, 2001 11:00PM

ARTICLE BEGINNING

1993 ENGINE COOLING
Mazda Cooling System Specifications

Mazda; RX7

COOLING SYSTEM SPECIFICATIONS

COOLING SYSTEM SPECIFICATIONS (WITH HEATER)

Application	Qts. (L)
RX7	9.3 (8.8)

END OF ARTICLE

DRIVE BELT ADJUSTMENT SPECIFICATIONS
Article Text

1993 Mazda RX7
For www.iluvmyrx7.com

Sunday, August 19, 2001 11:01PM

ARTICLE BEGINNING

1993 ENGINE COOLING
Mazda Drive Belt Adjustment Specifications

Mazda; RX7

BELT ADJUSTMENT SPECIFICATIONS

BELT ADJUSTMENT SPECIFICATIONS (NEW BELT)

Application	(1) Deflection - In. (mm)
Alternator	15/64-17/64 (6-7)
A/C Compressor	9/64-5/32 (3.5-4)
Power Steering Pump	9/64-5/32 (3.5-4)

(1) - Deflection with 22 lbs. (10 kg) pressure applied midway on belt run.

END OF ARTICLE

ENGINE COOLING FAN
Article Text
1993 Mazda RX7
For www.iluvmyrx7.com

Sunday, August 19, 2001 11:01PM

ARTICLE BEGINNING

1993 ENGINE COOLING
Mazda Engine Cooling Fans

Mazda; RX7

ELECTRIC COOLING FAN

COMPONENT TESTING

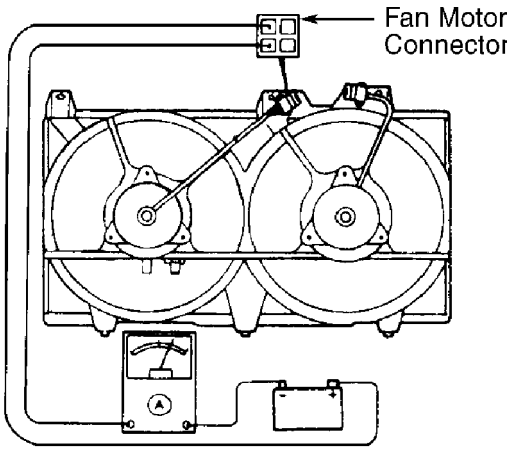
COOLING FAN MOTOR CURRENT SPECIFICATIONS

Engine	Amps
Low Speed	5.8-11.8
Medium Speed	6.5-12.5
High Speed	10.6-16.6

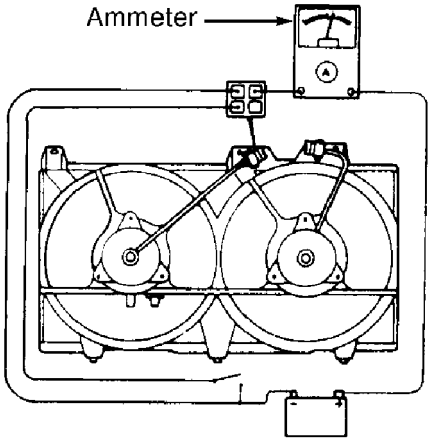
Cooling Fan Motor (2-Speed or 3-speed)

1) Ensure battery is fully charged. Disconnect cooling fan motor connector. Connect ammeter between battery and cooling fan motor connector for desired fan speed test. See Fig. 1.

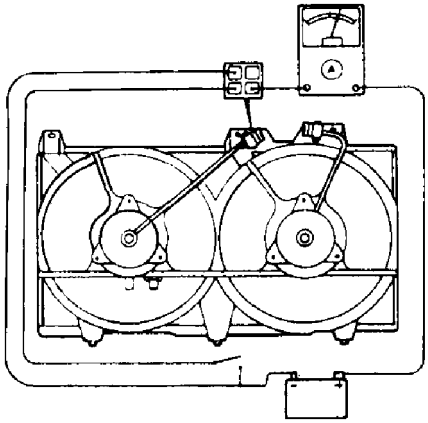
2) Ensure fan motor operates smoothly on all speeds at specified current. Check current draw against COOLING FAN MOTOR CURRENT SPECIFICATIONS table. See Fig. 1. If fan motor draws more or less than specified amperage, check wiring. If wiring is good, replace fan motor.



LOW SPEED



MEDIUM SPEED



HIGH SPEED

93E84552

Fig. 1: Testing Cooling Fan Motor
Courtesy of Mazda Motors Corp.

Thermoswitch

1) Turn ignition switch to OFF position. Remove thermoswitch from thermostat housing. Suspend switch in container filled with water. If thermoswitch has 2 terminals, connect ohmmeter between thermoswitch terminals. If thermoswitch has 1 terminal, connect ohmmeter between terminal and thermoswitch base. Gradually heat water while checking switch resistance. See Fig. 2. See THERMOSWITCH RESISTANCE TEST table.

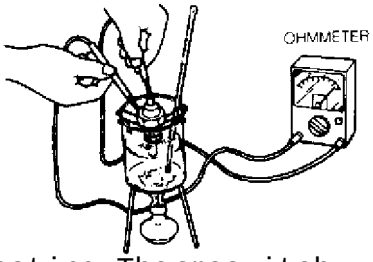


Fig. 2: Testing Thermoswitch
Courtesy of Mazda Motors Corp.

THERMOSWITCH RESISTANCE TEST TABLE

Coolant Model & Temperature	Resistance
214øF (101øC)	.5X (Maximum)
226øF (108øC)	1.0X (Minimum)

Cooling Fan Relay

1) Disconnect negative battery cable. Slide relays off of mounting bracket, located on left side of engine compartment. Remove fan relays. See Fig. 3.

2) Check for continuity between fan relay terminals "A" and "B". See Fig. 3. Continuity should not exist. Check for continuity between terminals "C" and "D." Continuity should exist.

3) Apply battery voltage between terminals "C" and "D". If no continuity exists between terminals "A" and "B", replace relay. If relay is good, check fuse and wiring.

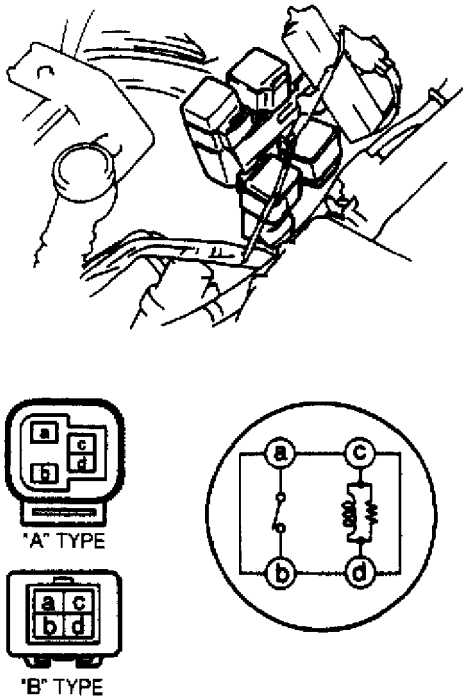


Fig. 3: Testing Cooling Fan Relay
Courtesy of Mazda Motors Corp.

WIRING DIAGRAMS

NOTE: For wiring circuit information, see appropriate wiring diagram.

END OF ARTICLE

1.3L ROTARY TURBO
Article Text
1993 Mazda RX7
For www.iluvmyrx7.com

Sunday, August 19, 2001 11:01PM

ARTICLE BEGINNING

1993 MAZDA ENGINES
1.3L Rotary Turbo

RX7

ENGINE IDENTIFICATION

Engine number is stamped on left front of engine housing, below alternator. Engine model number is stamped on engine, above oil filler and oil dipstick.

ENGINE IDENTIFICATION CODES TABLE

Application	Engine Code
RX7	
1.3L Rotary Turbo	RE 13B

REMOVAL & INSTALLATION

NOTE: For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Also place mating marks on engine hood and other major assemblies before removal.

FUEL PRESSURE RELEASE

Release fuel pressure by starting engine and removing circuit opening relay (located in underhood fuse and relay block). After engine stalls, turn ignition off and reinstall circuit opening relay.

ENGINE

Removal

1) Mark and remove hood. Remove battery and tray. Remove engine undercover. Drain engine oil and coolant. Remove air intake duct, air cleaner and hoses. Remove engine compartment strut bar. Disconnect radiator hoses and heater hoses.

2) Mark and remove throttle cable and cruise cable. Remove underhood fuse box mounting bolts. Move underhood fuse box aside with harness attached. Mark and disconnect necessary electrical connectors and vacuum hoses. Disconnect and plug fuel hoses. Remove drive belts. Remove power steering pump and A/C compressor with hoses attached and tie aside.

3) Disconnect oil pipes from oil cooler. Remove exhaust pipe and turbocharger heat shields. Remove exhaust head pipe. On A/T equipped models, disconnect transmission cooler pipe from lower radiator tank. Remove bolt securing transmission cooler pipes. Remove

torque converter-to-flexplate bolts.

4) On all models, remove starter assembly. Remove transmission-to-engine bolts. Remove engine mount nuts. Remove engine out top of vehicle.

Installation

To install, reverse removal procedure. Tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article. Fill fluid levels.

INTAKE MANIFOLD

Removal

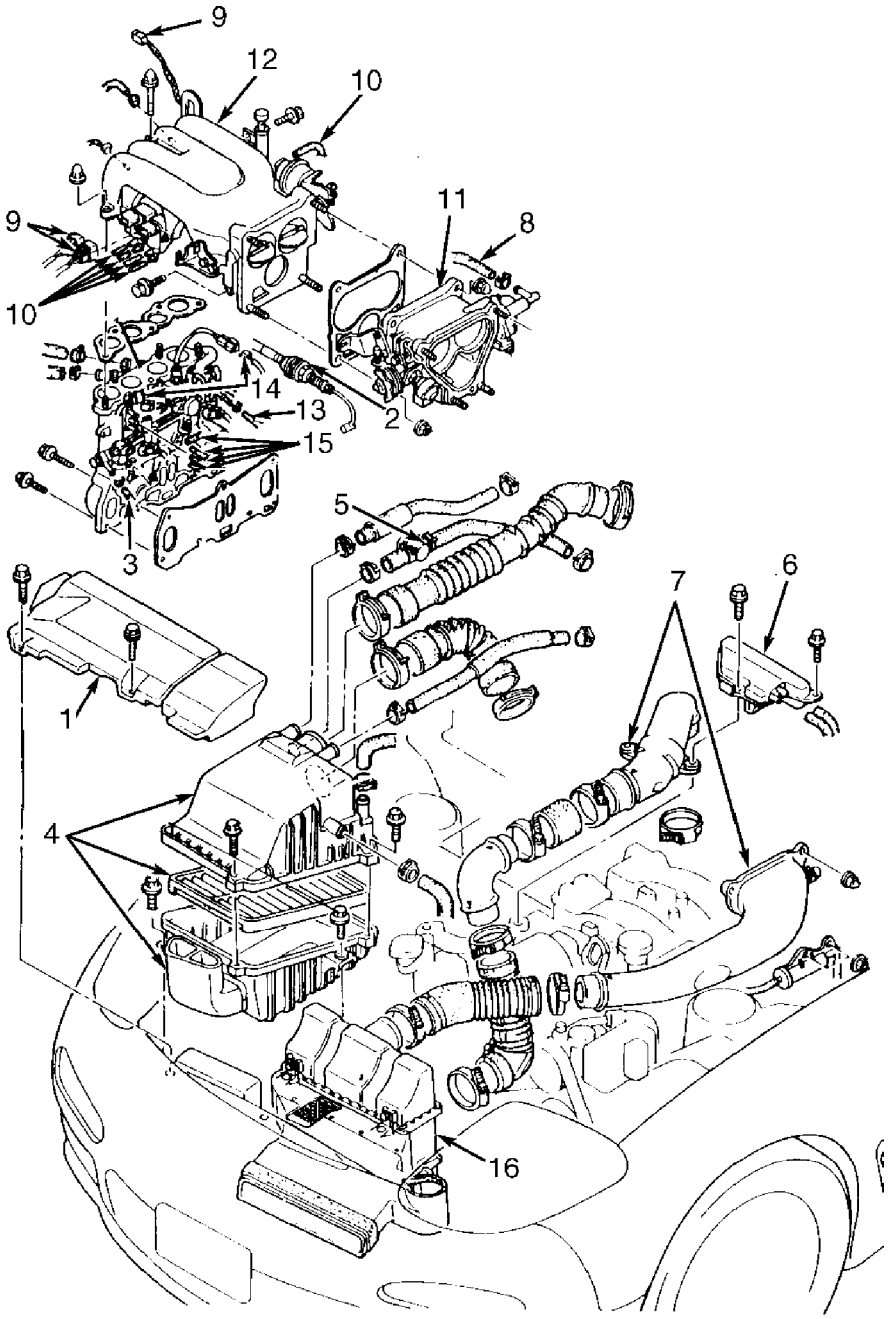
1) Raise and support vehicle. Drain coolant. Disconnect negative battery cable. Remove air cleaner, intake air hoses and pressure chamber. See Fig. 1. Remove air bypass valve. Remove air intake pipe. Remove coolant hose from throttle body. Disconnect vacuum hoses.

2) Remove accelerator cable, cruise control cable and throttle body assembly. Remove upper intake manifold bolts and upper intake manifold.

3) Disconnect fuel hose from injector fuel rail. Disconnect vacuum hoses at intake manifold. Disconnect fuel injector wire harness connector. Remove intake manifold-to-engine bolts and remove intake manifold.

Installation

1) To install, reverse removal procedure. Use NEW gaskets. Tighten nuts and bolts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.



1. Fresh Air Duct
2. Throttle Cable
3. Intake Manifold
4. Air Cleaner
5. Air By-Pass Valve
6. Pressure Chamber
7. Air Intake Hose
8. Coolant Hose
9. Connector
10. Vacuum Hose
11. Throttle Body
12. Upper Intake Manifold
13. Fuel Hose
14. Connector
15. Vacuum Hose
16. Intercooler

93D79510

Fig. 1: Exploded View Of Air Intake System
Courtesy of Mazda Motors Corp.

TURBOCHARGER/EXHAUST MANIFOLD

Removal

1) Raise and support vehicle. Drain coolant. Disconnect negative battery cable. Remove air cleaner, intake air hoses and pressure chamber. See Fig. 1. Disconnect accelerator cable from throttle body. Disconnect vacuum hoses. Remove pressure chamber.

2) Remove drive belt and air injection pump. Disconnect oxygen sensor, exhaust downpipe and catalytic converter. Disconnect turbo control valve assembly. See Fig. 2. Disconnect oil pipes from turbocharger. Remove coolant hoses.

3) Remove any remaining vacuum or air hoses. Remove bolts securing exhaust manifold to engine. Remove turbocharger/exhaust manifold assembly from vehicle. Place turbocharger/exhaust manifold assembly on bench. Remove turbochargers and control valve from exhaust manifold.

Installation

Install turbocharger with NEW gaskets, "O" rings and exhaust manifold studs. Tighten nuts and bolts to specification. See Fig. 3. See TORQUE SPECIFICATIONS TABLE at the end of this article. To complete installation, reverse removal procedure. Prime oil system.

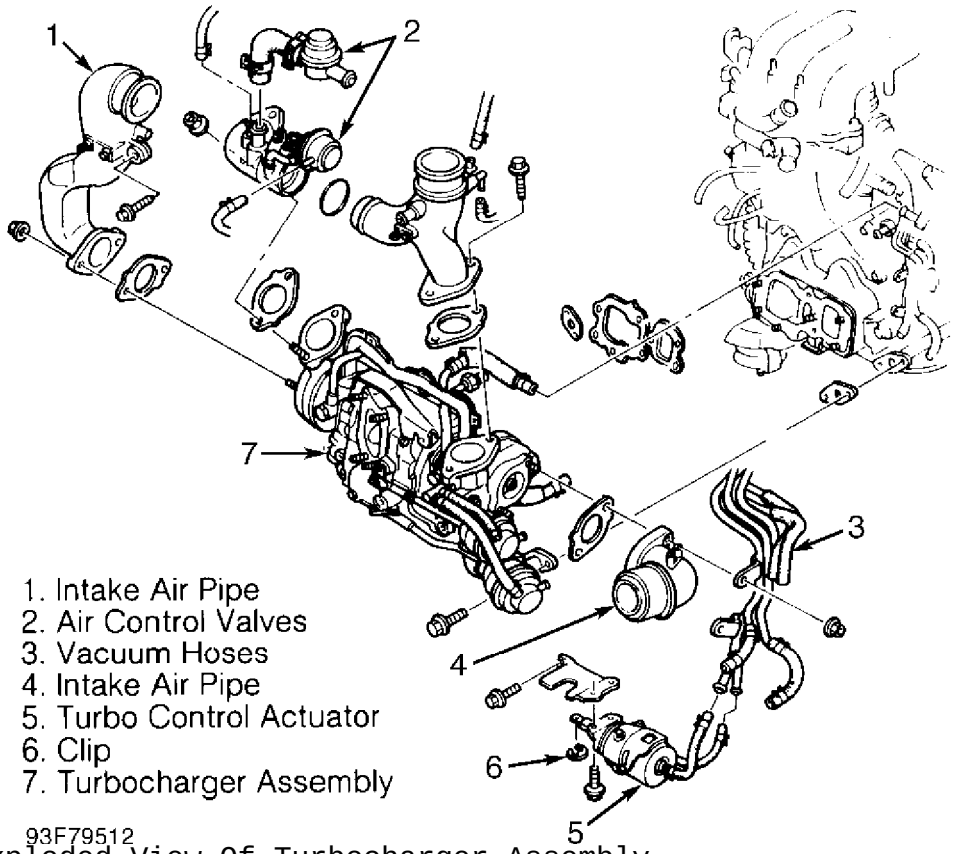
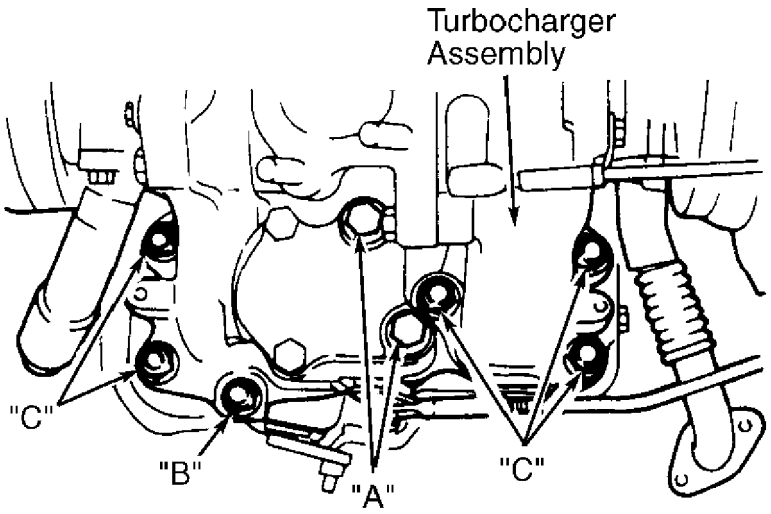


Fig. 2: Exploded View Of Turbocharger Assembly
Courtesy of Mazda Motors Corp.



"A" : Tighten To 28-38 Ft. Lbs (38-51 N.m)
"B" : Tighten To 16-21 Ft. Lbs (22-29 N.m)
"C" : Tighten To 32-42 Ft. Lbs (44-57 N.m)

93G79513
Fig. 3: Installing Turbocharger
Courtesy of Mazda Motors Corp.

REAR ECCENTRIC SHAFT OIL SEAL

Removal

Disconnect negative battery cable. Drain engine oil. Remove transmission. On vehicles with manual transmission, install Ring Gear Brake (49-F011-101) or on vehicle with automatic transmission, install Counter Weight Stopper (49-1881-055). Using Flywheel Box Wrench (49-0820-035), remove flywheel or flexplate. Remove rear seal.

Installation

Apply engine oil to lip of new seal and install in rear cover. Install oil seal flush with edge of rear cover. Reverse removal procedure to complete installation. Tighten lock nut to 289-362 ft. lbs. (392-491 N.m).

WATER PUMP

Removal

1) Remove battery and battery tray. Remove air cleaner, fresh air duct and intake air hoses. Remove radiator drain plug and drain coolant. Remove water pump drive belt. Remove water pump pulley.

2) Remove alternator and air injection pump. Remove upper radiator hose. Remove intercooler, air separation tank and related brackets. Remove lower radiator hose and bypass hoses from water pump.

3) Disconnect metering oil tube. Remove water pump bolts and nuts and remove water pump. Remove temperature sensor connector.

Installation

To install, reverse removal procedure. Tighten water pump

nuts to 13-20 ft. lbs. (18-26 N.m). Tighten drive belts and refill coolant.

OIL PAN

Removal

1) Disconnect negative battery cable. Raise and support vehicle. Remove splash shield. Drain engine oil. Remove stabilizer bar. Support engine using Engine Mount Bracket (49-G017-5A0).

2) Remove engine mount-to-crossmember nuts. Disconnect power steering oil pipes at steering gear and mounting bracket on crossmember. Remove steering gear mounting bolts. Disconnect lower control arms from steering knuckles.

3) Remove crossmember-to-chassis bolts. Remove crossmember from vehicle. Remove engine mounts from engine. Remove oil pan mounting bolts. Insert knife or screwdriver between oil pan and engine and carefully loosen oil pan from engine. Remove oil pan.

Installation

To install, reverse removal procedure. Ensure all old sealant is removed from oil pan bolts. Tighten oil pan bolts to 79-104 INCH lbs. (9-12 N.m). Tighten engine mounts to 55-69 ft. lbs. (75-93 N.m). Add engine oil. Start engine and check for leaks.

DISASSEMBLY

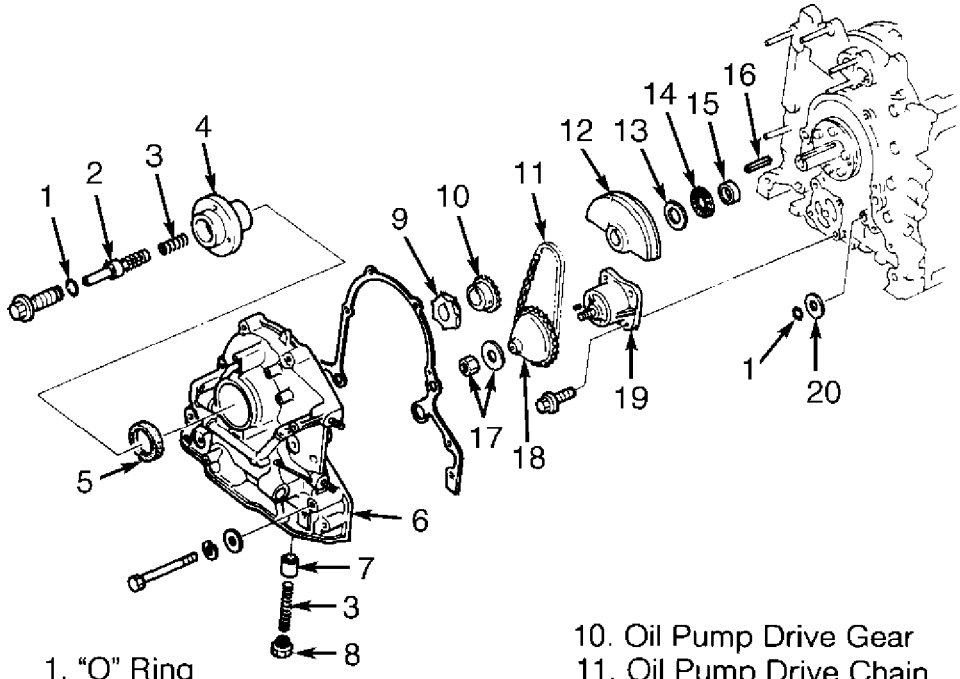
NOTE: Disassembly procedures are with engine removed from vehicle.

Disassembly

1) Remove all external components, oil pan bolts, oil pan and oil strainer. While holding flexplate/flywheel, remove lock bolt on front of eccentric shaft. Remove "O" ring, by-pass valve, spring. See Fig. 4. Remove eccentric shaft pulley, crank angle sensor and pulley hub.

2) Remove front cover. Remove oil control valve from front cover. Remove oil pump sprockets and chain. Remove oil pump. Remove counter balance weight, Woodruff key needle bearing and spacer. See Fig. 4.

3) Remove flywheel (M/T) using Flywheel Brake (49-F011-101), or counter weight (A/T) using Counter Weight Stopper (49-1881-055). Loosen tension bolts gradually in sequence. See Fig. 5. Remove tension bolts.



1. "O" Ring
2. Eccentric Shaft By-Pass Valve
3. Spring
4. Pulley Hub
5. Front Eccentric Shaft Seal
6. Front Cover
7. Oil Control Valve
8. Plug
9. Drive Gear
10. Oil Pump Drive Gear
11. Oil Pump Drive Chain
12. Balance Weight
13. Thrust Washer
14. Needle Bearing
15. Spacer
16. Woodruff Key
17. Nut & Washer
18. Oil Pump Sprocket
19. Oil Pump
20. Back-Up Ring

Fig. 4: Exploded View Of Front Cover & Components
Courtesy of Mazda Motors Corp.

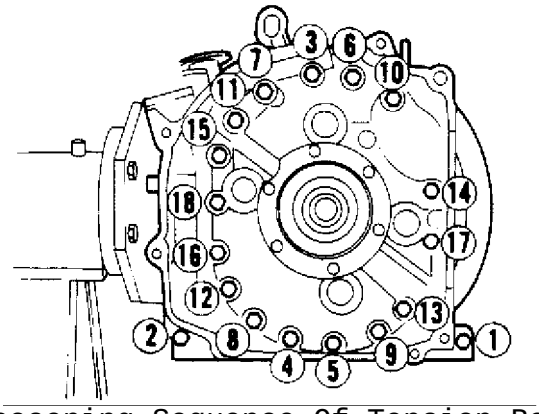


Fig. 5: Loosening Sequence Of Tension Bolts
Courtesy of Mazda Motors Corp.

CAUTION: Keep all apex, side and corner seals matched and in respect to numbers near each groove on rotor face. See Fig. 6.

4) Remove rear housing. If seals stick to rear housing, remove and place them into their original position. Remove rear oil seal from rear housing. See Fig. 7. Remove rear stationary gear. Remove oil regulator valve, oil pressure switch and temperature sender from rear housing.

5) Using a small slide hammer, remove tubular dowel from rear rotor housing. Before removing rear rotor housing, remove side pieces from rear rotor, keeping them in order. See Fig. 22. Carefully lift off rear rotor housing. Remove "O" ring from dowel hole. Remove rear rotor seals and springs, keeping them in order. Mark rear rotor for reassembly.

CAUTION: DO NOT place rotor assembly on a hard surface.

6) To remove rear rotor, rock back and forth while pulling rotor. Remove seals and springs, keeping them in order. Remove intermediate housing tubular dowel. Turn eccentric shaft so journal faces short axial direction. See Fig. 8. Remove intermediate housing (without removing eccentric shaft), while pushing eccentric shaft upward.

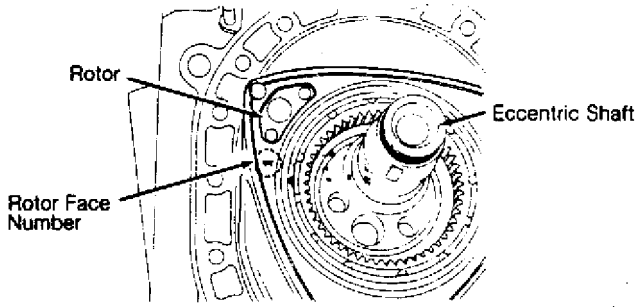
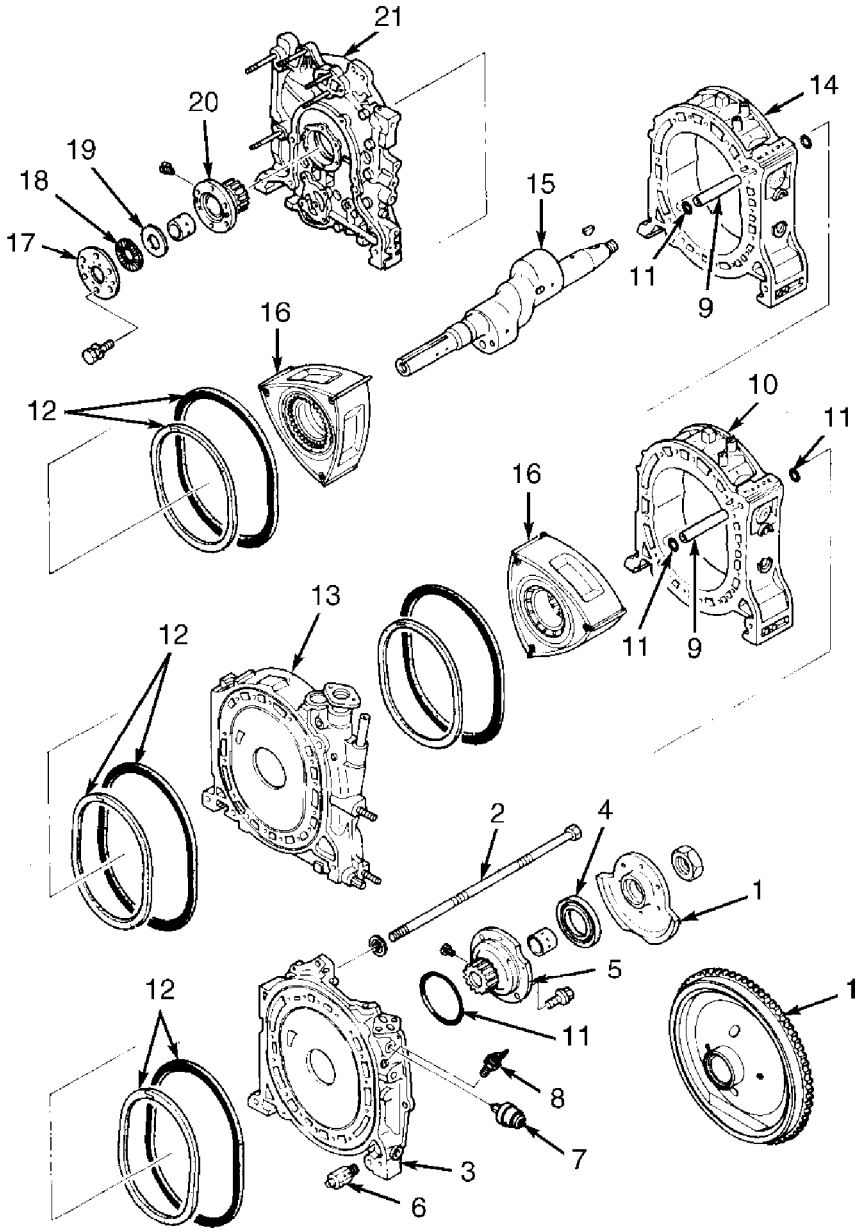


Fig. 6: Locating Rotor Face Number
Courtesy of Mazda Motors Corp.



1. Flywheel (M/T)/Counterweight (A/T)
2. Tension Bolts
3. Rear Housing
4. Rear Oil Seal
5. Rear Stationary Gear
6. Oil Regulator Valve
7. Oil Pressure Switch
8. Temperature Sender
9. Tubular Dowel
10. Rear Rotor Housing
11. "O" Ring
12. Sealing Rubber
13. Intermediate Housing
14. Front Rotor Housing
15. Eccentric Shaft
16. Rotor
17. Needle Bearing Retaining Plate
18. Needle Bearing
19. Thrust Washer
20. Front Stationary Gear
21. Front Housing

Fig. 7: Exploded View Of Internal Engine
Courtesy of Mazda Motors Corp.

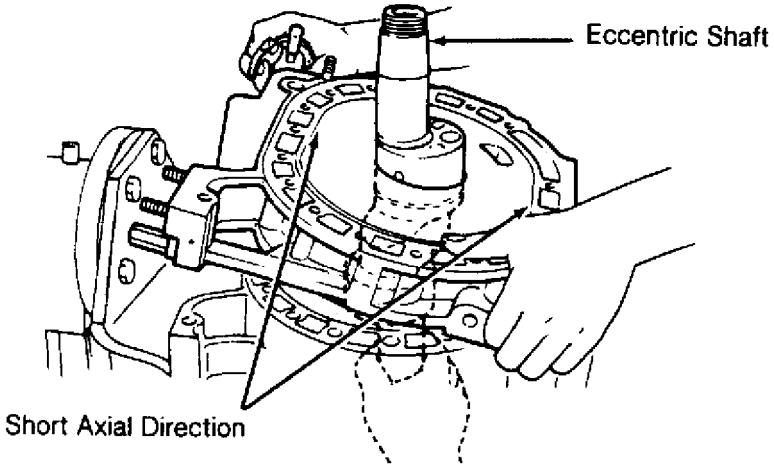


Fig. 8: Removing Intermediate Housing
Courtesy of Mazda Motors Corp.

7) If seals stick to intermediate housing surface, remove and place in original position. Remove sealing rubbers. Remove front rotor side pieces, keeping them in order. Remove front rotor housing. Remove "O" ring from dowel hole.

8) Turn eccentric shaft so journal faces short axial direction. See Fig. 8. Pull out eccentric shaft with front rotor. To remove front rotor, rock front rotor back and forth. Using Seal Remover (49 0813 225), remove outer oil seal from front rotor. See Fig. 9. Remove remaining seals, springs and "O" ring.

9) Remove needle bearing retaining plate bolts from front housing. Remove needle bearing retaining plate, needle bearing, thrust washer and front stationary gear from front housing.

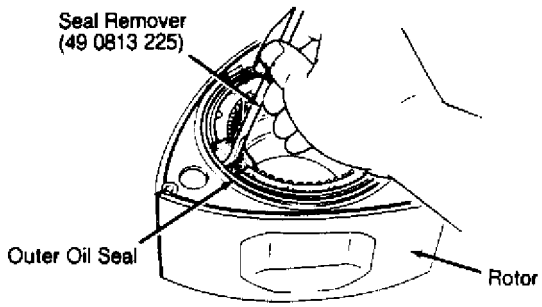


Fig. 9: Removing Oil Seal From Rotor
Courtesy of Mazda Motors Corp.

CLEANING

HOUSINGS

Cleaning

Clean sealing compound from surfaces with a cloth or brush soaked in solvent or thinner. Remove carbon on side surfaces of rotor chamber with extra-fine emery paper. DO NOT damage surface. Remove

carbon from inner surface of rotor housings with cloth soaked in solvent or thinner. Remove deposits and rust from coolant passages on housings. Check rotor housings thoroughly for gas or water leakage.

ROTOR

Cleaning

Remove carbon from rotor with sponge and carbon cleaning chemical. Use care not to damage soft material coating on side surfaces of rotor. Remove carbon from grooves. Wash rotor in cleaning solution. Clean carbon from seals and wash with cleaning solution. DO NOT use emery paper.

INSPECTION & OVERHAUL

FRONT, INTERMEDIATE & REAR HOUSINGS

Inspection & Overhaul

1) Using a straightedge and feeler gauge, check housings for warpage. See Fig. 10. See ROTOR HOUSING, INTERMEDIATE HOUSING & ROTOR in ENGINE SPECIFICATIONS tables at end of article. If not within specifications, replace housing(s).

2) Using dial indicator and Mount (49-0727-570), check seal contact surface for wear by sliding indicator across surface. Check oil seal and side seal step wear from inside to outside of each seal tracking pattern. See Fig. 11. See OIL SEAL STEP WEAR SPECIFICATIONS table. Replace as necessary.

OIL SEAL STEP WEAR SPECIFICATIONS TABLE

Application	In. (mm)
Side Seal Wear	.0039 (.099)
Side Seal Wear Overlapping Oil Seal Wear	.0004 (.010)
Side Seal Wear Outside Oil Seal Wear	.0039 (.099)
Oil Seal Wear	.0008 (.020)

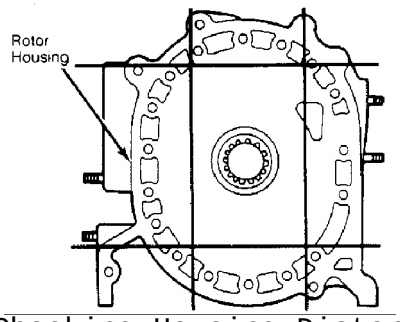


Fig. 10: Checking Housing Distortion
Courtesy of Mazda Motors Corp.

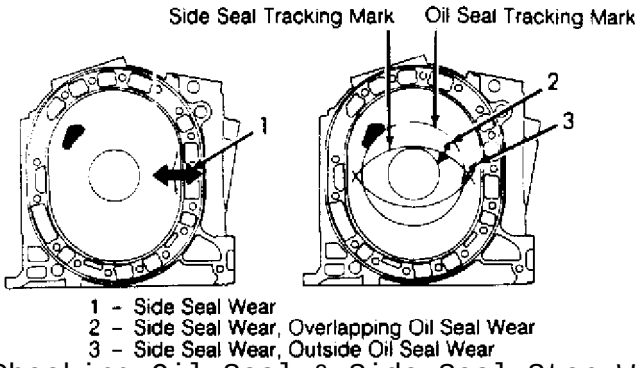


Fig. 11: Checking Oil Seal & Side Seal Step Wear
Courtesy of Mazda Motors Corp.

STATIONARY GEARS

Inspection & Overhaul

1) Check front and rear stationary gear for cracked worn or chipped teeth. To replace front stationary gear, remove plate, needle bearing and thrust plate. To replace rear stationary gear, remove bolts and drive gear out with a drift.

2) To install front stationary gear, reverse removal procedure. To install rear stationary gear, apply petroleum jelly to new "O" ring and place on rear stationary gear. Align stationary gear housing slot with housing dowel pin. Apply sealant to gear flange. Align slot with dowel and tap gear in place. Tighten bolts to specifications. See TORQUE SPECIFICATIONS TABLE at the end of this article.

ECCENTRIC SHAFT & MAIN BEARING

Inspection & Overhaul

1) Clean eccentric shaft in solvent. Apply compressed air to oil passages. Check oil jet for weak spring and stuck or damaged steel check ball. Place eccentric shaft in "V" blocks and check shaft runout. Maximum runout allowable is .0024" (.06 mm).

NOTE: The main bearing oil clearance specification allows for a wider tolerance on outside ends of eccentric shaft main bearing journals. See Fig. 12.

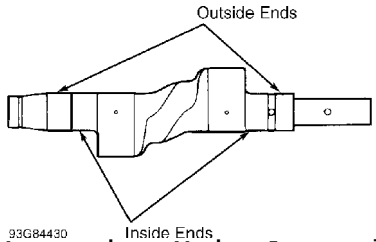


Fig. 12: Measuring Main Journal Taper
Courtesy of Mazda Motors Corp.

2) To find main bearing clearance, measure main bearing I.D. and eccentric shaft journal O.D. in at least 4 points of each bearing and journal. See ECCENTRIC SHAFT MAIN & ROTOR BEARINGS table in ENGINE SPECIFICATIONS at end of article. If not within specifications, replace main bearing and/or eccentric shaft. To replace main bearing, remove rear stationary gear as previously described. Remove screw retaining main bearing.

3) Press bearing from gear side to flange side. To install main bearing, press bearing in opposite direction of removal. Ensure new bearing lug aligns with slot on stationary gear.

ROTOR HOUSING

Inspection & Overhaul

Check chromium-plated surface on housing for damage. Using a micrometer, measure rotor housing width at points "A", "B", "C" and "D". See Fig. 13. Difference between "A" value and minimum value among "B", "C" and "D" is distortion. If distortion is not within specifications, replace housing. See ROTOR HOUSING, INTERMEDIATE HOUSING & ROTOR in ENGINE SPECIFICATIONS tables at end of article.

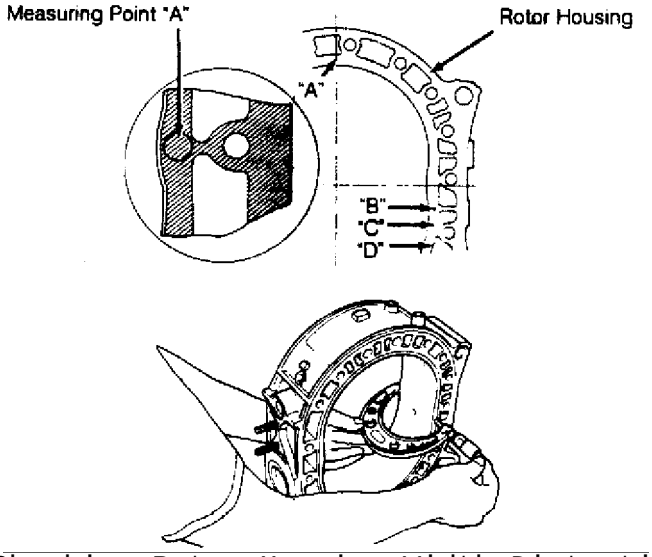


Fig. 13: Checking Rotor Housing Width Distortion
Courtesy of Mazda Motors Corp.

ROTORS

Inspection & Overhaul

1) Visually inspect rotors replace if any visual defects are found. Check condition of internal gear. Check clearance between rotor and rotor housing. Measure maximum rotor width at 3 points of rotor (near each apex). See Fig. 14. Clearance is difference between rotor housing value "A" (as previously described) and maximum width of rotor. See ROTOR HOUSING, INTERMEDIATE HOUSING & ROTOR in ENGINE SPECIFICATIONS tables at end of article.

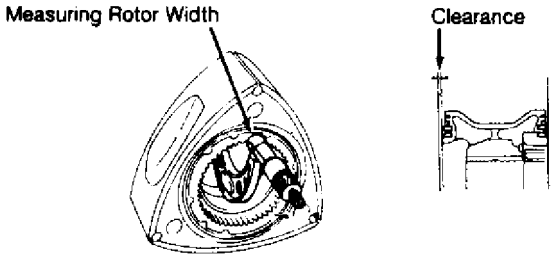


Fig. 14: Measuring Rotor-to-Side Housing Clearance
Courtesy of Mazda Motors Corp.

2) If clearance is greater or less than specification, replace rotor assembly. Check rotor corner seal bores for wear with Go-No-Go Gauge (49 0839 165). See Fig. 15. If neither end of gauge fits into rotor bores, use original corner seals. If both ends of gauge fit into bores, replace rotor. If one end of gauge does not fit and other end does, replace corner seals.

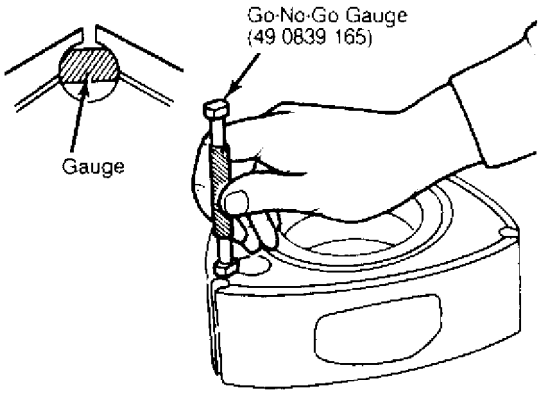


Fig. 15: Checking Corner Seal Bore Wear
Courtesy of Mazda Motors Corp.

ROTOR BEARING

Inspection & Overhaul

1) Check rotor bearing clearance. Measure I.D. of rotor bearing and O.D. of rotor bearing journal on eccentric shaft. Replace rotor bearing if clearance exceeds specifications. See ECCENTRIC SHAFT MAIN & ROTOR BEARINGS in ENGINE SPECIFICATIONS tables at end of article.

2) To replace bearing, place rotor in press with internal gear downward. Using Rotor Bearing Replacer (49 0813 240) without adapter ring, press bearing from rotor. To install, reverse removal procedure. Press new bearing in from opposite side as removed. Ensure bearing lug is aligned with slot in rotor bore.

ROTOR OIL SEALS & SPRINGS

Inspection & Overhaul

Inspect oil seal for wear or damage and replace as necessary.

Measure seal lip width. Maximum width is .020" (.51 mm). Install oil seal springs and oil seals on rotor. Measure seal protrusion. Replace oil seal and/or springs if protrusion is less than .020" (.51 mm). See Fig. 16.

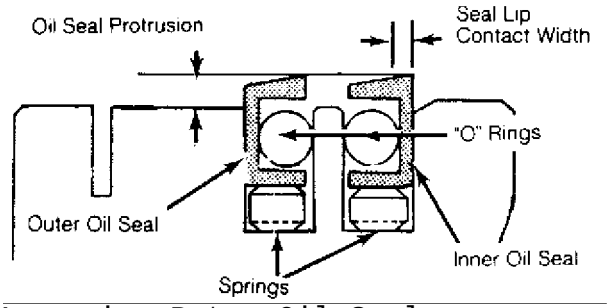


Fig. 16: Measuring Rotor Oil Seal
Courtesy of Mazda Motors Corp.

APEX SEAL & SPRING

Inspection & Overhaul

1) Measure combined height of upper and lower apex seal at 2 points. See Fig. 17. Combined height should be a minimum of .256" (6.5 mm). Replace short apex seal spring if apex seal height is less than .295" (7.5 mm).

2) To check apex seal warpage, put 2 apex seals together top edge-to-top edge. Measure between top surfaces of apex seals with a feeler gauge. See Fig. 17. Check all apex seals. If warpage exists in the middle of seals, replace apex seals. If end of seals are warped, seals can be reused.

3) Install apex seal in rotor in its original groove. Check clearance between apex seal and rotor groove with feeler gauge. See Fig. 18. Replace apex seal if not within specification. See APEX SEAL table in ENGINE SPECIFICATIONS at end of article.

4) Check apex seal spring for wear and free height. See Fig. 19. Replace long spring if free height is less than .18" (4.6 mm). Replace short spring if free height is less than .067" (1.7 mm).

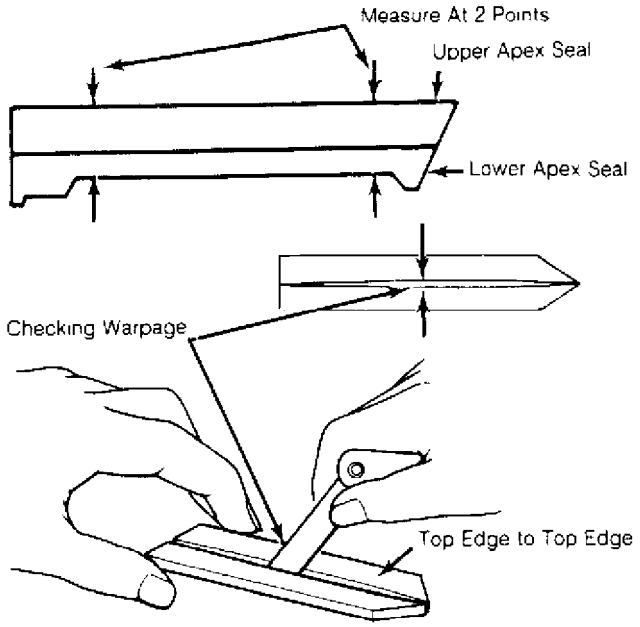


Fig. 17: Checking Apex Seal Height & Warpage
Courtesy of Mazda Motors Corp.

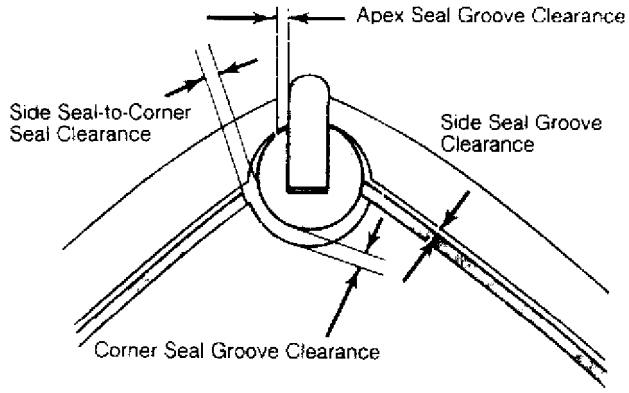


Fig. 18: Measuring Apex, Side & Corner Seal Clearance
Courtesy of Mazda Motors Corp.

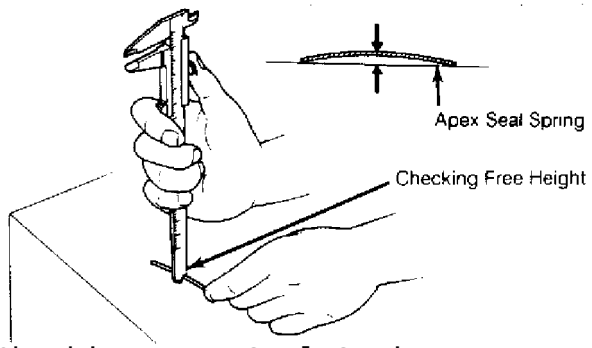


Fig. 19: Checking Apex Seal Spring Free Height
Courtesy of Mazda Motors Corp.

SIDE SEAL & SPRING

Inspection & Overhaul

1) With side seal and spring installed, press seal with finger and ensure it moves freely in groove. Check side seal protrusion. Replace side seal and/or spring if not within specifications. Side seal protrusion should be .020" (.50 mm).

2) Check clearance between side seal and groove with feeler gauge. See Fig. 18. Replace side seal if clearance exceeds specifications. Check clearance between side seals and corner seals. Replace side seals if clearance exceeds specification. See SIDE SEAL table in ENGINE SPECIFICATIONS at end of article.

3) When replacing side seals, adjust clearance between new side seal and corner seal by filing one end of side seal. Using a fine-cut file or sandpaper, shape cut unfinished end to match contour of corner seal. Adjust clearance to .002-.006" (.05-.15 mm).

CORNER SEAL, SOFT SEAL & SPRING

Inspection & Overhaul

Install corner spring and seal in rotor groove. Check free movement of seal by pressing with finger. Check corner seal protrusion from side surface of rotor. Replace corner seals or springs if corner seals protrude less than .02" (.5 mm). See CORNER SEAL table in ENGINE SPECIFICATIONS at end of article.

NEEDLE BEARING & THRUST PLATE

Inspection & Overhaul

Check needle bearing and thrust plate for wear or damage. Replace as necessary.

OIL PUMP DRIVE CHAIN & SPROCKETS

Inspection & Overhaul

Check oil pump drive chain for broken links. Check oil pump sprockets for cracks, wear or damaged teeth. Replace as necessary.

REASSEMBLY

NOTE: Replace all rubber seals. Apply clean engine oil to all sliding and rotating parts.

INNER & OUTER ROTOR OIL SEALS

Reassembly

1) Place rotor on a soft surface. Ensure new oil seal (without "O" ring) moves smoothly in its groove. Properly install oil seal springs indicated by Cream or Blue paint. See Fig. 20. Fit round edge of spring in stopper hole of groove.

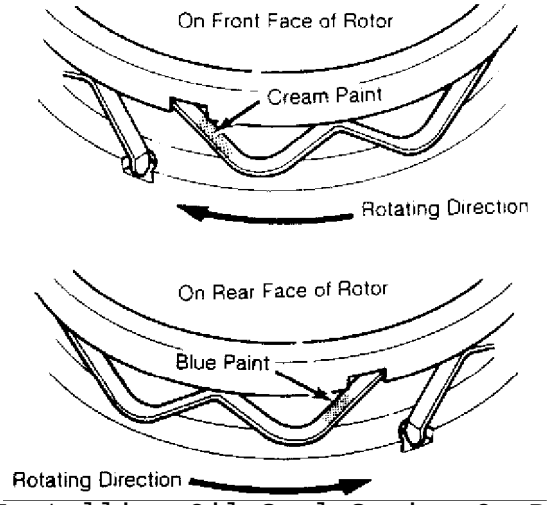


Fig. 20: Installing Oil Seal Spring On Rotor
Courtesy of Mazda Motors Corp.

2) Install new "O" ring in oil seal. Place inner oil seal in groove with square edge of spring in oil seal notch. Using old oil seal, push new seal until lip of new seal is .016" (.41 mm) below rotor surface. See Fig. 21. Carefully install remaining oil seal springs and oil seals without deforming oil seal lip. See Fig. 22. Push each oil seal slowly by hand and confirm free movement of seal.

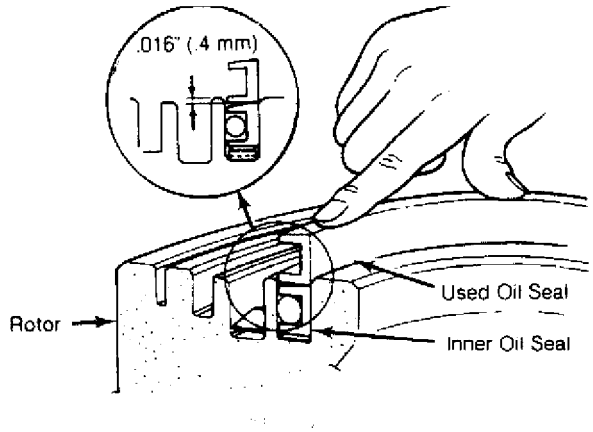
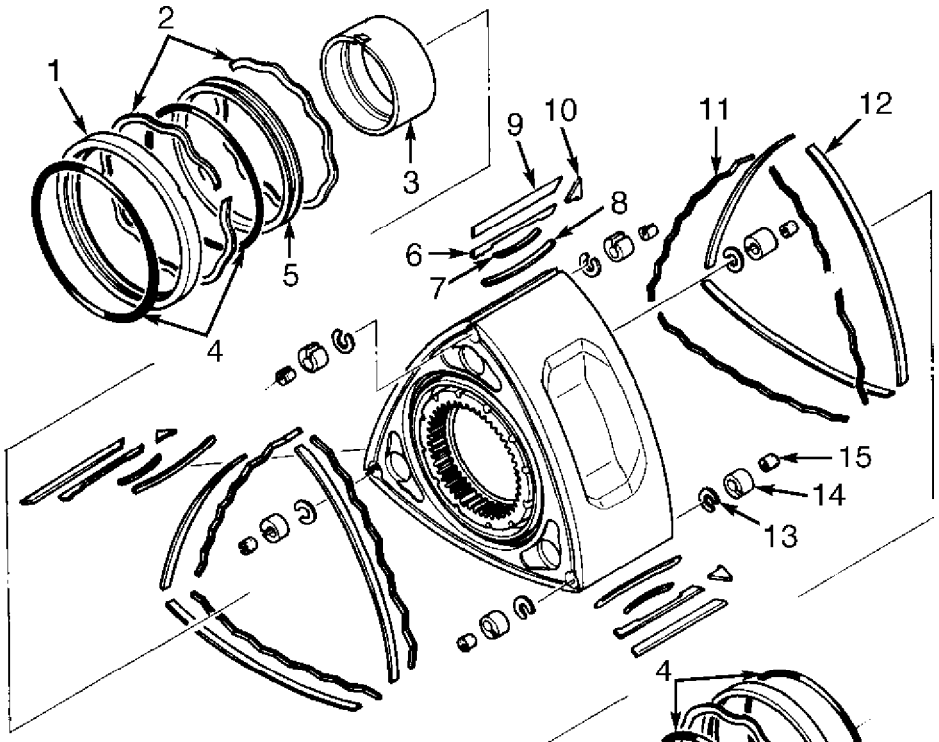


Fig. 21: Installing Oil Seal On Rotor
Courtesy of Mazda Motors Corp.



1. Outer Oil Seal
2. Oil Seal Spring
3. Rotor Bearing
4. "O" Ring
5. Inner Oil Seal
6. Lower Apex Seal
7. Short Apex Seal Spring
8. Long Apex Seal Spring
9. Apex Seal
10. Side Piece
11. Side Seal Spring
12. Side Seal
13. Corner Seal Spring
14. Corner Seal
15. Soft Seal

93D84429

Fig. 22: Exploded View Of Rotor Seals
Courtesy of Mazda Motors Corp.

FRONT HOUSING

NOTE: DO NOT apply engine oil to sealing rubber.

Reassembly

1) Mount front housing on engine stand. Position thrust plate with chamfer facing front housing. Install needle bearing and plate. Tighten plate bolts to 15 ft. lbs. (19 N.m). Apply petroleum jelly to new outer and inner sealing rubbers. Install outer sealing rubber with White paint facing groove side wall. See Fig. 23.

2) Install inner sealing rubber so Blue paint faces groove outer wall and seam is positioned properly. See Fig. 23. Ensure sealing rubbers are NOT twisted. Apply engine oil to contact surfaces,

stationary gear and main bearing.

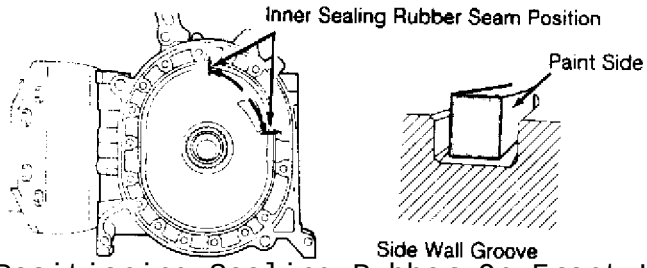


Fig. 23: Positioning Sealing Rubber On Front Housing
Courtesy of Mazda Motors Corp.

APEX SEAL & ASSIST PIECE

CAUTION: DO NOT place rotors on hard surface, use clean rubber pad or cloth.

Reassembly

Assemble apex seal and assist piece. Cut assist piece into a length of .08-1.1" (2.0-2.8 mm). Remove backing and stick assist piece to apex seal. See Fig. 24. Make sure side surfaces are flush.

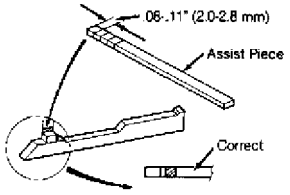


Fig. 24: Installing Assist Piece To Apex Seal
Courtesy of Mazda Motors Corp.

APEX, SOFT, CORNER & SIDE SEALS (FRONT SIDE OF ROTOR)

NOTE: Improperly installed apex seals may result in poor gas sealing performance.

Reassembly

1) Place front rotor on a soft surface (front side upward). Install upper and lower apex seals (without springs). Install side seals and corner seals on one side of rotor, apex seal springs and seals on other side of rotor will be installed after rotor is installed in housing. Side piece end is positioned to rear side of rotor. Install new soft seal into corner seal. Install corner seal spring. See Fig. 22.

2) Install corner seal, with chamfered surface facing bottom of groove. Install side seal springs and seals with painted surface facing bottom of groove. Ensure smooth movement of each corner and side seal by lightly pressing them. Apply petroleum jelly to side

seals.

FRONT ROTOR & ECCENTRIC SHAFT

Reassembly

1) Apply engine oil to rotor oil seal, rotor bearing and internal gear. Place front rotor in front housing and mesh internal gear and stationary gear. Ensure one rotor apex is set at one of 4 positions on housing. See Fig. 25. DO NOT place rotor on sealing rubbers. Apply engine oil to front rotor journal and main journal. Carefully insert eccentric shaft.

2) Tap needle bearing into eccentric shaft. Apply grease to needle bearing. Apply engine oil to oil seal lip, front rotor journal and main journal. Carefully insert eccentric shaft without damaging rotor or main bearings.

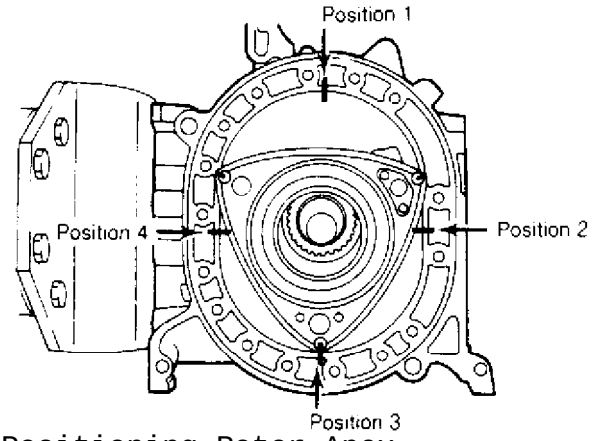


Fig. 25: Positioning Rotor Apex
Courtesy of Mazda Motors Corp.

FRONT ROTOR HOUSING

Reassembly

Apply petroleum jelly to new "O" ring and install. Apply sealant to front side of rotor housing. See Fig. 26. Apply engine oil to trochoid (rotor running) rotor housing surface. Install front rotor housing. Apply engine oil to tubular dowels and install dowels.

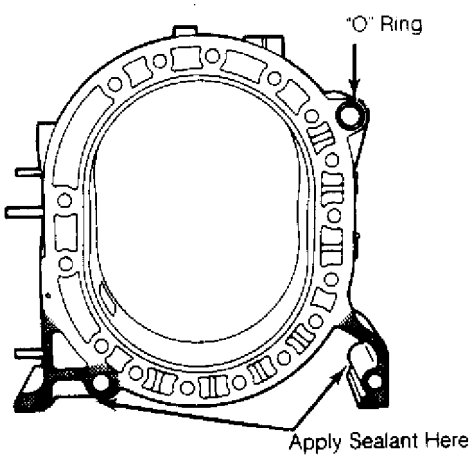


Fig. 26: Applying Sealant To Housing
Courtesy of Mazda Motors Corp.

ROTOR SEALS (REAR SIDE OF ROTOR)

Reassembly

Install short and long apex seal springs. See Figs. 27 & 28. Install new soft seal into corner seal. Install corner seal spring. Install corner seal with chamfered surface facing bottom of groove. Install side seal springs and seals with painted surface facing bottom of groove. Ensure smooth movement of each corner and apex seal assembly by pressing lightly.

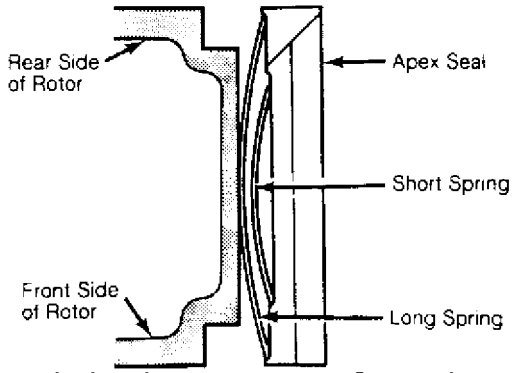


Fig. 27: Positioning Apex Seal Springs
Courtesy of Mazda Motors Corp.

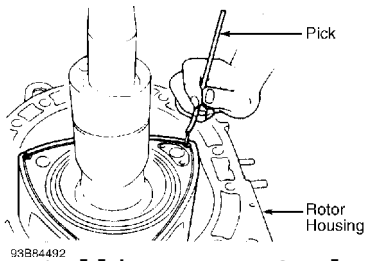


Fig. 28: Installing Apex Seal Springs
Courtesy of Mazda Motors Corp.

INTERMEDIATE HOUSING

Reassembly

1) Apply petroleum jelly to new outer and inner sealing rubbers. Install outer sealing rubber with White paint facing side wall of groove. Install inner sealing rubber to front side with the Blue paint area facing outer wall of groove and position seam properly. See Fig. 29.

2) Ensure sealing rubbers are not twisted. DO NOT apply engine oil to sealing rubbers. Apply engine oil to housing contact surfaces and rotor oil seal. Apply petroleum jelly to new "O" ring and install. Apply sealant to housing. See Fig. 26.

3) Turn the eccentric shaft so journal faces short axial direction. See Fig. 8. Lift eccentric shaft about 1.0" (25.5 mm) and install intermediate housing opposite of removal. DO NOT lift shaft more than 1.4" (35 mm).

4) Install outer and inner sealing rubbers to rear side of intermediate housing using same method as in step 1). Apply engine oil to contact surfaces. DO NOT apply engine oil to sealing rubbers.

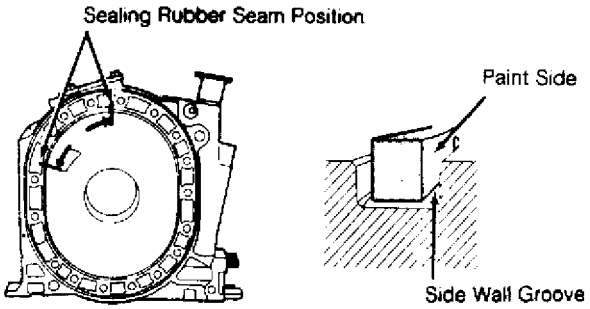


Fig. 29: Positioning Sealing Rubber On Intermediate Housing
Courtesy of Mazda Motors Corp.

REAR ROTOR, ROTOR SEALS & REAR ROTOR HOUSING

Reassembly

To reassemble, use procedure described for front rotor assembly. See FRONT ROTOR HOUSING.

NOTE: The side piece of rotor seal must face rear housing side.

REAR HOUSING

Reassembly

1) Apply engine oil to new rear oil seal and groove of rear stationary gear. Install oil seal into rear stationary gear. Install oil regulator valve and tighten to 51-58 ft. lbs. (69-78 N.m).

2) Apply petroleum jelly to new outer and inner sealing rubbers. Install outer sealing rubber with White paint facing side wall in groove. Install inner sealing rubber with Blue paint facing outer wall in groove. Ensure sealing rubbers are NOT twisted. Align seams to proper position. See Fig. 29.

3) Apply oil to contact surfaces, stationary gear and main

bearing. DO NOT apply oil to sealing rubbers. Coat rear rotor oil seal with oil. Apply petroleum jelly to new "O" ring and install in rear rotor housing. Apply sealant to lower outside edges of rear rotor housing.

4) Install rear housing on rear rotor housing. Ensure pieces of front and rear apex seals DO NOT wedge between rotor housing and side housing.

REAR HOUSING COVER

NOTE: The tension bolt marked "M" on bolt head is for No. 17 position and bolt with tube is for No. 18 position. See Fig. 30.

Reassembly

Apply engine oil to new seal washers and housing bolt threads. Install tension bolts and tighten gradually in sequence to specification. See Fig. 30. Turn eccentric shaft to ensure rotation is easy and smooth.

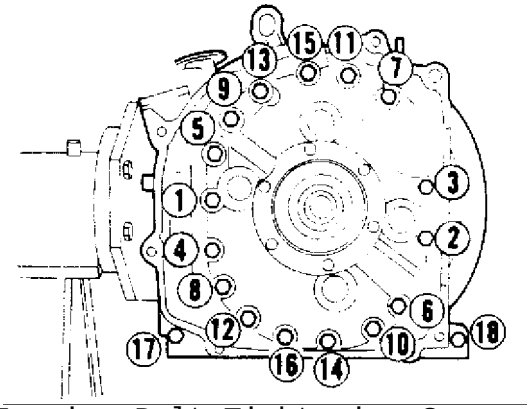


Fig. 30: Tension Bolt Tightening Sequence
Courtesy of Mazda Motors Corp.

FLYWHEEL/FLEXPLATE

Reassembly

Apply engine oil to rear housing seal. Insert Woodruff key in eccentric shaft. On M/T models, install flywheel. On A/T models, install counterweight. On all models, apply thread locking compound to eccentric shaft threads. Apply sealant to large nut contact surface. Install and tighten large nut to 290-362 ft. lbs. (392-490 N.m).On A/T models, install flex plate, rear plate and tighten evenly to 32-45 ft. lbs. (43-61 N.m).

BALANCE WEIGHT, BEARING & SPACER

Reassembly

1) Install spacer, thrust needle bearing, thrust washer, balance weight, oil pump sprocket and drive gear. See Fig. 4. Ensure needle bearing is NOT wedged by spacer. Install eccentric shaft pulley

hub and lock bolt. Tighten bolt to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

2) Measure end play of eccentric shaft with dial indicator attached to either flywheel/flexplate or eccentric shaft pulley. If not within specifications, replace spacer with a thicker or thinner spacer. See ECCENTRIC SHAFT MAIN & ROTOR BEARINGS table in ENGINE SPECIFICATIONS at end of article. With end play within specification, remove lock bolt, pulley, drive gear and oil pump drive sprocket.

FRONT COVER

Reassembly

1) Apply engine oil to oil pump shaft and install oil pump. Install Woodruff key on eccentric shaft. Install oil pump drive gear, oil pump sprocket and chain as an assembly.

2) Install new washer and oil pump lock nut. Bend washer to lock nut. Install drive gear with chamfered surface toward front housing. Apply engine oil to new front cover oil seal and install seal into front cover. Install oil pressure control valve in front cover and tighten to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

3) Apply petroleum jelly to "O" ring and install on front cover with new front cover gasket. Install front cover and tighten to specification. Install eccentric shaft pulley hub. Install lock bolt and tighten by hand. Remove lock bolt and measure pulley hub protrusion. See Fig. 31. If protrusion exceeds .0961" (2.44 mm), needle bearing may be wedged by spacer. Remove and reposition needle bearing if necessary.

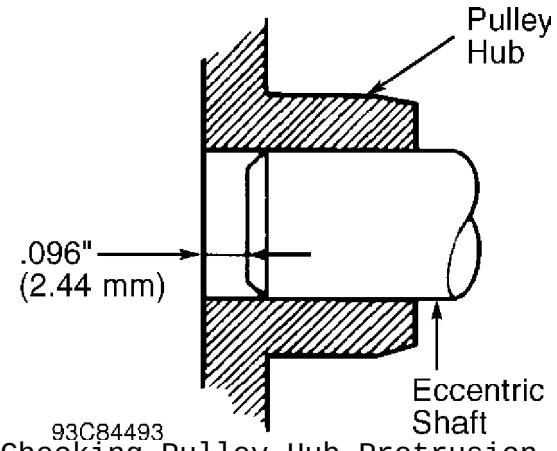


Fig. 31: Checking Pulley Hub Protrusion
Courtesy of Mazda Motors Corp.

4) Apply thread locking compound to new lock bolt threads and sealant to flange face of bolt. Install spring, by-pass valve, NEW "O" ring and lock bolt into eccentric shaft. Install oil strainer and new gasket. Tighten to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

5) Apply a .16-.24" (4.1-6.1 mm) diameter bead of silicone sealant to both sides of the gasket. Sealant must be continuously

rimmed inside of bolt thread holes and ends should overlap. Install oil pan and tighten to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article. To complete reassembly, reverse disassembly procedure.

EXTERNAL COMPONENTS

Reassembly

1) To reassemble external components, reverse disassembly procedure. Install White painted oil tube to oil nozzle in front rotor housing and yellow painted oil tube into oil nozzle in rear rotor housing. Ensure notch on mixing plate aligns with notch in mating hole in intermediate housing.

2) Ensure oil tubes are connected to metering oil pump as shown. See Fig. 32. Install exhaust manifold gaskets with crimped side facing exhaust manifold. When installing turbocharger tighten bolts in sequence to specification See Fig. 3.

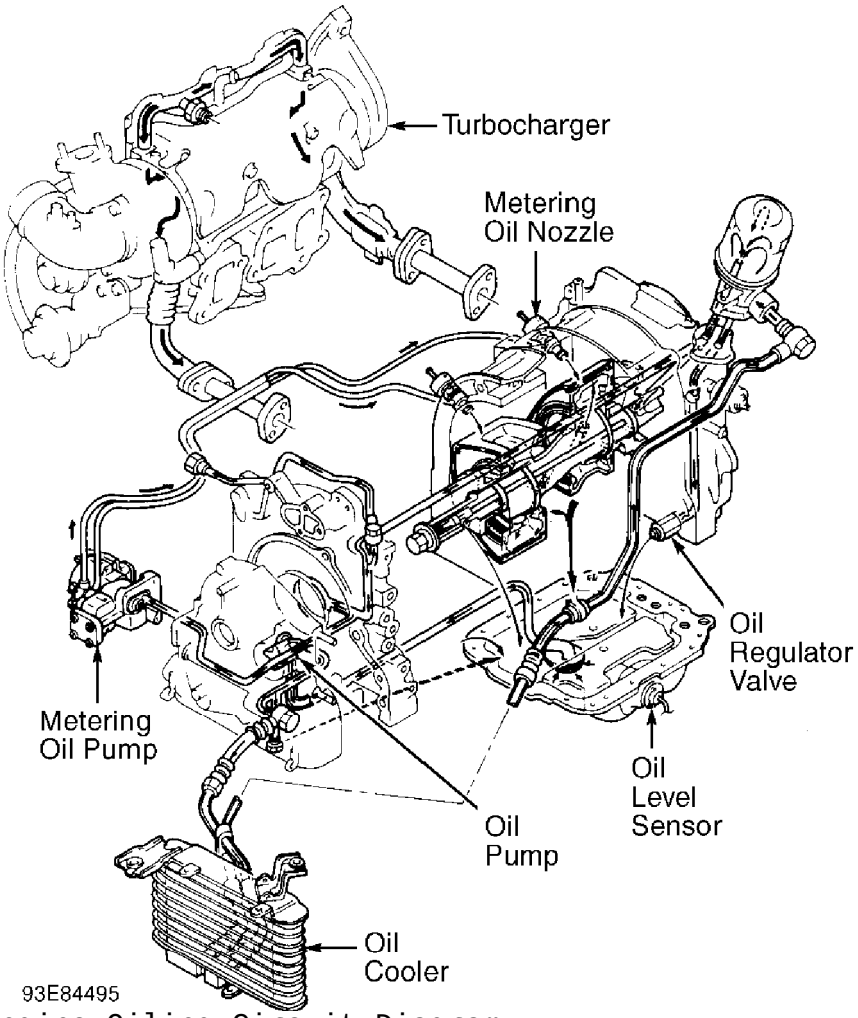


Fig. 32: Engine Oiling Circuit Diagram
Courtesy of Mazda Motors Corp.

ENGINE OILING

ENGINE LUBRICATION SYSTEM

Crankcase Capacity
Dry Fill crankcase capacity is 5 qts. (4.7L). Oil change W/filter replacement capacity is 3.9 qts. (3.7L).

Oil Pressure
With engine warm and at 3000 RPM, oil pressure should be 50 psi (3.5 kg/cmý) minimum.

NOTE: Engine oil pump is mounted behind front cover. For removal procedure, see DISASSEMBLY and Fig. 4.

OIL PUMP

Disassembly & Reassembly
With oil pump removed, remove snap ring from rear of shaft. Remove rotors and plates. Remove lock screw and remove shaft. See Fig. 33. To reassemble, reverse disassembly procedure. Ensure match marks on outer rotor and inner rotors face front housing.

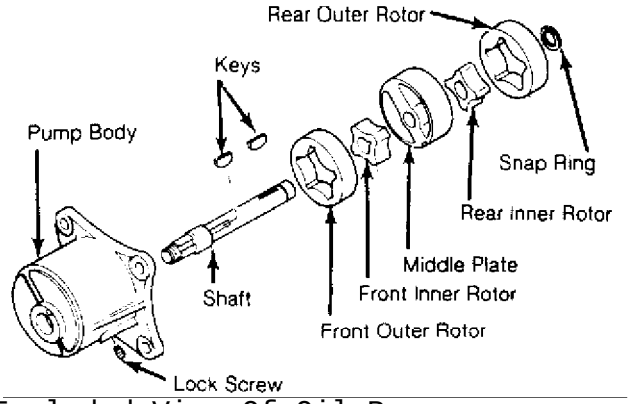


Fig. 33: Exploded View Of Oil Pump
Courtesy of Mazda Motors Corp.

Inspection
If oil pump is not within specifications, replace components as necessary. See OIL PUMP SPECIFICATIONS table.

OIL PUMP SPECIFICATIONS TABLE

Application	In. (mm)
Inner Rotor Tip-To-Outer Rotor Tip	
Standard	.0012-.0047 (.031-.119)
Limit	.0059 (.150)
Oil Pressure Control Valve Spring Free Length	2.87 (72.9)
Outer Rotor-To-Pump Body	
Standard	.0079-.0098 (.201-.249)

Limit ..... .0118 (.300)
Rotor-to-Mounting Surfaces (1)
Standard ..... .0012-.0051 (.031-.130)
Limit ..... .0059 (.150)

(1) - Specification is clearance of rotor-to-body plus clearance of front housing rotor sliding surface-to-front housing mounting surface.

METERING OIL PUMP

Removal

Drain engine oil. Disconnect electrical connectors. Disconnect oil tubes and note location for reassembly. Remove mounting bolts and pump from front housing. Remove "O" ring.

Inspection

Metering oil pump is controlled by ECU and can set Codes 20, 26, 27 and 37 if unit or wiring are malfunctioning. See SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

Installation

Coat new "O" ring with engine oil and replace oil tube gasket. Install pump and tighten mounting bolts to 69-95 INCH lbs. (8-11 N.m). To complete installation, reverse removal procedure.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Counterweight Large Nut (A/T)	290-362 (392-490)
Eccentric Shaft Pulley Bolt	180-200 (240-270)
Exhaust Manifold Nut	23-34 (32-46)
Flexplate Bolt (A/T)	32-45 (44-61)
Flywheel Large Nut (M/T)	290-362 (392-490)
Front Housing/Cover Bolt	12-17 (16-23)
Intake Manifold Bolt	14-19 (19-25)
Engine Mount Nut	34-49 (46-67)
Oil Inlet Pipe Bolt (Turbo)	14-17 (18-22)
Metering Oil Nozzle-To-Housing	12-17 (16-23)
Oil Pressure Control Valve Plug	29-36 (39-49)
Oil Pump Sprocket Nut	23-34 (32-46)
Tension Bolt (1)	24-29 (32-39)
Rear Stationary Gear Bolt	12-17 (16-23)
Engine Mount-To-Oil Pan	55-69 (75-93)
Spark Plug	10-13 (13-18)
Thrust Plate Bolt	12-17 (16-23)
Turbo Mount Nut	(2)
Water Pump Nut	13-19 (18-26)

	INCH Lbs. (N.m)
EGR Valve	69-95 (7.8-10.7)
Metering Oil Pump-To-Housing Bolt	69-95 (7.8-10.7)
Oil Pan Bolt	79-104 (8.9-11.7)
Oil Pump Housing-To-Front Housing Bolt	61-87 (6.9-9.8)
Oil Strainer Bolt	79-104 (8.9-11.7)

(1) - Tighten in sequence. See Fig. 30.
(2) - Tighten in sequence. See Fig. 3.

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS TABLE

Application	Specification
Displacement	80.0 Cu. In. (1.3L)
Compression Ratio	9.0:1
Fuel System	PFI
Horsepower @ RPM	255 @ 6500
Torque Ft. Lbs. @ RPM	217 @ 5000

ROTOR HOUSING, INTERMEDIATE HOUSING & ROTOR

ROTOR HOUSING, INTERMEDIATE HOUSING & ROTOR TABLE

Application	In. (mm)
Front & Rear Rotor Housing	
Width	3.15 (80.0)
Distortion Limit	.0024 (.060)
Front, Intermediate & Rear Housing	
Wear/Distortion Limit	.0016 (.041)
Rotor	
Width	3.1368 (79.67)
Housing-To-Rotor Clearance	
Standard	(1) .0047-.0083 (.119-.211)
Minimum limit	.004" (.10 mm).

APEX SEAL

APEX SEAL TABLE

Application	In. (mm)

Seal Width	.079 (2.0)
Seal Height	
Standard	.33 (8.5)
Minimum	.295 (7.5)
Seal-To-Groove Clearance	
Standard	.002-.004 (.051-.101)
Maximum Wear Limit	.006 (.15)

SIDE SEAL

SIDE SEAL TABLE

Application	In. (mm)
Thickness	.0260-.0270 (.661-.686)
Protrusion (Min.)	.020 (.51)
Seal-To-Groove	
Clearance	.0011-.0031 (.028-.078)
Limit	.004 (.10)
Side Seal-To-Corner Seal	
Clearance	.002-.006 (.05-.15)
Limit	.016 (.40)

ECCENTRIC SHAFT MAIN & ROTOR BEARINGS

ECCENTRIC SHAFT MAIN & ROTOR BEARINGS TABLE

Application	In. (mm)
Eccentric Shaft	
Runout	.0027 (.06)
End Play	
Standard	.0016-.0028 (.041-.070)
Maximum	.0035 (.09)
Main Journal Diameter	1.693 (43.0)
Rotor Journal Diameter	2.9 (74)
Main Bearings	
Clearance (Inside End)(1)	(2) .0023-.0031 (.060-.079)
Clearance (Outside End)(1)	(3) .0031-.0043 (.079-.110)
Inside Diameter	1.6939-1.6949 (43.025-43.050)
Rotor Bearing	
Inside Diameter	2.9144-2.9153 (74.025-74.050)
Clearance	(2) .0023-.0031 (.060-.080)

(1) - See Fig. 12.
(2) - Wear limit is .0043" (.11 mm).
(3) - Wear limit is .0051" (.13 mm).

CORNER SEAL

CORNER SEAL TABLE

Application	In. (mm)
Diameter	.4327-.4336 (10.990-11.014)
Height	.276 (7.0)
Side Seal-To-Corner Seal	
Clearance	.002-.006 (.05-.15)
Limit	.016 (.40)

END OF ARTICLE

AA - USING THIS SECTION (GENERAL HELP INFORMATION)
Article Text

1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 06:36AM

ARTICLE BEGINNING

ENGINE PERFORMANCE
How To Use This Section

INTRODUCTION

NOTE: Because there are so many possible combinations of articles for the different manufacturers and models, the new hyper-text capabilities built into this product DO NOT apply to this article.

It is the purpose of this repair information system to help professional automotive technicians maintain top vehicle performance and correct driveability problems related to today's high tech vehicles.

Because of the limited amount of space allowable for the this product, our titles have been condensed to fit into the menus. An alphabetical designation has been added to the front of each title to allow the titles to be displayed in a way that reflects their respective order of use. References to the titles in some of the diagnostic flow charts sometimes will not correlate with the titles in the this product menu. If not, refer to the MENU CROSS-REFERENCE table below.

MENU CROSS-REFERENCE TABLE

Title	Associate Print (Book) Title:
A - ENGINE/VIN I D	Introduction
B - EMISSION APPLICATION	Emission Applications
C - TUNE-UP SPECS	Service & Adjustment Specifications
C - SPECIFICATIONS	Service & Adjustment Specifications
D - ADJUSTMENTS	On-Vehicle Adjustments
E - THEORY/OPERATION	Theory & Operation
F - BASIC TESTING	Basic Diagnostic Procedures
G - TESTS W/ CODES	Self-Diagnostics
H - TESTS W/O CODES	Trouble Shooting - No Codes
I - SYS/COMP TESTS	Systems & Component Testing
J - PIN VOLTAGE CHARTS	Pin Voltage Charts
K - SENSOR RANGE CHARTS	Sensor Operating Range Charts
L - WIRING DIAGRAMS	Wiring Diagrams
M - VACUUM DIAGRAMS	Vacuum Diagrams
N - REMOVE/INSTALL/OHAUL	Removal, Overhaul & Installation

Because of this we recommend that you read the rest of these INTRODUCTION paragraphs to better understand why the information is presented in this new format.

The A - ENGINE/VIN I D article will help you identify the vehicle and its systems. It will also explain the VIN code and in many cases, show its location.

If you want "TUNE-UP" type information, see D - ADJUSTMENTS for the adjustment procedures. If you are familiar with the procedures, but need a quick way to find the specification, go to C - TUNE-UP SPECS or C - SPECIFICATIONS for the specifications pertaining to the vehicle.

When diagnosing driveability problems, first go to F - BASIC TESTING. This article is here to help eliminate wasted diagnostic time. If the basic systems are working properly, go to G - TESTS W/ CODES.

If the vehicle still is having a driveability problem or if the vehicle has no self-diagnostic system, go to H - TESTS W/O CODES. This article will help you diagnose the problem by symptom, locate the symptom exhibited by the vehicle, and inspect or test the items which may be causing the problem.

After finding which specific system or component requires testing, use the I - SYS/COMP TESTS article to tests the systems and components. We have also included (when available) pin voltage charts and sensor range charts. These can be found in J - PIN VOLTAGE CHARTS and K - SENSOR RANGE CHARTS.

Also included in this section are wiring diagrams and vacuum diagrams. These can be found in L - WIRING DIAGRAMS and M - VACUUM DIAGRAMS.

When all diagnostic tests have been performed and the problem has been discovered, it may be necessary to replace or overhaul the defective part. This information can be found in N - REMOVE/INSTALL/OHAUL.

The content of each of these articles is outlined below. As a summary of the driveability diagnosis, see ROUTINE OUTLINE in this article.

A - ENGINE/VIN ID

This article shows how to identify the model and engine by its Vehicle Identification Number (VIN). A model coverage chart shows each model and engine, the fuel system, ignition system and engine code. The engine serial number locations are also included in this article.

B - EMISSION APPLICATION

These charts identify the emission systems and sub-systems applicable to each model and engine combination.

C - TUNE-UP SPECS

This is a collection of quick-reference type specifications. This article is helpful when you are familiar with proper adjustment procedures and only need specifications. Included in this section are:

* Battery specifications.
* Fluid capacities.

* Replacement intervals.
* Belt adjustment.
* Engine Compression.
* Valve clearance.
* Valve Arrangement.
* Ignition coil specifications.

* High tension wire resistance.
* Spark plug type and gap.
* Firing order.
* Ignition timing.
* Fuel pump performance and injector resistance specifications
* Slow and fast idle speed and mixture specifications.
* Carbon monoxide (CO) level specifications.
* Throttle position sensor/switch specifications.

C - SPECIFICATIONS

This is a collection of quick-reference type specifications. This article is helpful when you are familiar with proper adjustment procedures and only need specifications. Included in this section are:

* Battery specifications.
* Fluid capacities.
* Replacement intervals.
* Belt adjustment.
* Engine Compression.
* Valve clearance.
* Valve Arrangement.
* Ignition coil specifications.

* High tension wire resistance.
* Spark plug type and gap.
* Firing order.
* Ignition timing.
* Fuel pump performance and injector resistance specifications
* Slow and fast idle speed and mixture specifications.
* Carbon monoxide (CO) level specifications.
* Throttle position sensor/switch specifications.

D - ADJUSTMENTS

This article contains the information that use to be included in the TUNE-UP section. Checking and adjusting valves, spark plugs, spark plug wires, base ignition timing and idle speed are found in this section. Use this article for routine maintenance. Also, if you have a driveability problem, ensure all on-vehicle adjustments are correct before proceeding with any diagnosis.

E - THEORY/OPERATION

This article covers basic theory and operation of engine performance-related systems and components. Before diagnosing vehicles or systems with which you are not completely familiar, read this article.

F - BASIC TESTING

When diagnosing driveability problems, there are certain "BASIC DIAGNOSTIC PROCEDURES" which must FIRST be performed. It is necessary to perform a careful, complete check of basic engine mechanical and electrical conditions, and verify spark availability and adequate fuel supply.

The procedures apply to both computerized and non-computerized systems. If all systems are okay, go to G - TESTS W/ CODES for vehicles with self-diagnostic systems or H - TESTS W/O CODES for diagnosis by symptom.

G - TESTS W/ CODES

Use this article to retrieve and interpret trouble codes from the engine computer self-diagnostic system. Once information is retrieved, diagnostic procedures are given to help pinpoint and repair computer system/component faults. Necessary steps for clearing trouble codes are also given. If faults indicated by trouble codes are not present at time of testing, proceed to TESTS W/O CODES for intermittent testing procedures.

H - TESTS W/O CODES

This article helps trouble shoot driveability problems based upon available "SYMPTOMS" and "INTERMITTENT TESTING" procedures. Procedures in this section should lead you to specific component or system tests which may or may not be computer monitored/controlled.

I - SYS/COMP TESTS

In this article, you will find tests for systems and components related to air induction systems (turbochargers), fuel control, ignition control, and emissions control systems.

J - PIN VOLTAGE CHARTS

PIN VOLTAGE CHARTS are supplied (where available) to speed up the diagnostic process. By checking pin voltages at the electronic control unit, it is possible to determine if the control unit is receiving and transmitting proper voltage signals.

K - SENSOR RANGE CHARTS

Use the SENSOR OPERATING RANGE CHARTS to determine if a

sensor is out of calibration. A sensor that is out of calibration may not set a trouble code, but it will cause driveability problems.

L - WIRING DIAGRAMS

Use these WIRING DIAGRAMS to identify and trace component circuits, locate shorts and opens in circuits, and understand how individual circuits function as part of a system. The diagrams in this article are only for fuel, ignition and emission systems

M - VACUUM DIAGRAMS

The VACUUM DIAGRAMS will assist you in finding incorrectly routed vacuum hoses which may cause driveability problems or computer indicated malfunctions.

N - REMOVE/INSTALL/OHAUL

N - REMOVE/INSTALL/OHAUL contains information found in the sub-headings of REMOVAL, OVERHAUL & INSTALLATION. These are procedures and specifications required to remove, overhaul (if possible) and install components related to engine performance.

WHERE TO START

PERFORM BASIC INSPECTION

1) Verify customer complaint.
2) Perform visual inspection. See F - BASIC TESTING.
3) Test engine sub-system to determine that the following systems are functioning properly. See F- BASIC TESTING.

* Mechanical conditions (compression)
* Ignition output
* Fuel Delivery

4) Check air induction system for leaks.
5) Check & adjust basic engine settings listed below to ensure they are to specification. See D - ADJUSTMENTS.

* Ignition timing
* Idle speed

CHECK FOR TROUBLE CODES

1) If equipped with self-diagnostics, check for trouble codes. Refer to G - TESTS W/ CODES.
2) Repair causes of trouble code(s).
3) Clear control unit memory.

SYMPTOM DIAGNOSIS

1) If no self-diagnostics available, or no trouble codes present, identify symptom.
2) See trouble shooting procedure to repair complaint. See H - TESTS W/O CODES

TEST SYSTEM

1) Perform necessary systems and component tests. See I - SYS/COMP TESTS.
2) Verify that complaint is repaired.

SAFETY PRECAUTIONS

* Always refer to Engine Tune-Up Decal in engine compartment before performing tune-up. If manual and decal differ, always use decal specifications.
* DO NOT allow or create a condition of misfire in more than one cylinder for an extended period of time. Damage to converter may occur due to loading converter with unburned air/fuel mixture.
* Always turn ignition off and disconnect negative battery cable BEFORE disconnecting or connecting computer or other electrical components.

* DO NOT drop or shock electrical components such as computer, airflow meter, etc.
* DO NOT use fuel system cleaning compounds that are not recommended by the manufacturer. Damage to gaskets, diaphragm materials and catalytic converter may result.
* Before performing a compression test or cranking engine using a remote starter switch, disconnect coil wire from distributor and secure it to a good engine ground, or disable ignition.
* Before disconnecting any fuel system component, ensure fuel system pressure is released.

* Use a shop towel to absorb any spilled fuel to prevent fire.
* DO NOT create sparks or have an open flame near battery.
* If any EFI components such as hoses or clamps are replaces, ensure they are replaced with components designed for EFI use.
* Always reassemble throttle body components with new gaskets, "O" rings and seals.
* If equipped with an inertia switch, DO NOT reset switch until fuel system has been inspected for leaks.
* Wear safety goggles when drilling or grinding.
* Wear proper clothing which protects against chemicals and other hazards.

END OF ARTICLE

A - ENGINE/VIN ID
Article Text

1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 06:35AM

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda Introduction

1993 MODEL COVERAGE

MODEL COVERAGE TABLE

MODEL	BODY CODE	ENGINE (1)	ENGINE ID	FUEL SYSTEM	IGNITION SYSTEM
B2200	11, 12, 21, 22, 31, 32	2.2L 4-Cyl (8-Valve)	3	2V/PFI (2)	HEI (2)(3)
B2600i	11, 31, 41, 51, 61	2.6L 4-Cyl (12-Valve)	4	PFI	LED (4)
Miata	35	1.6L 4-Cyl (16-Valve)	1 (2 In Canada)	PFI	Hall Sensor
MPV	52, 62	2.6L 4-Cyl (12-Valve)	1	PFI	LED (4)
		3.0L V6 (18-Valve)	2	PFI	Magnetic
MX-3	43	1.6L 4-Cyl (16-Valve)(5)	1, 2, 3, 4	SFI	Hall Sensor (6)
MX-6	31	2.0L 4-Cyl (16-Valve)	A	SFI	Hall Sensor
		2.5L V6 (24-Valve)	B	SFI	Magnetic & Hall Sensor
Navajo	44	4.0L V6 (12-Valve)	X	PFI	DIS (7)
Protege	22	1.8L 4-Cyl (16-Valve)(8)	4, 6, 8	PFI	Hall Sensor
RX7	33	1.3L Rotary	1, 2	PFI	Magnetic
323	23	1.6L 4-Cyl (8-Valve) (9)	2, 4	PFI	Hall Sensor
626	22	2.0L 4-Cyl (16-Valve)	A	SFI	Hall Sensor
		2.5L V6 (24-Valve)	B	SFI	Magnetic & Hall Sensor

929	46	3.0L V6 (24-Valve)	1	SFI	Magnetic & Hall Sensor

(1) - See illustrations for engine code and serial number location.
(2) - California models have PFI systems with light emitting diode ignition system.
(3) - High Energy Ignition (HEI) system.
(4) - Light Emitting Diode (LED).
(5) - GS model has 1.8L V6 DOHC (24-valve) engine.
(6) - GS model also has magnetic sensor on crank pulley.
(7) - Distributorless Ignition System (DIS).
(8) - LX model has 1.8L 4-cyl. DOHC (16-valve) engine.
(9) - California models use a 1.6L 4-cyl. (16-valve) engine.

VIN DEFINITION (EXCEPT NAVAJO)

(VIN)	J	M	1	B	D	2	3	1	*	P	0	5	0	0	0	0	1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

1 - Indicates Nation of Origin.
2 - Indicates Manufacturer.
3 - Indicates Vehicle Type.
4-5 - Indicates Model.
6-7 - Indicates Body Style.
8 - Indicates Modification.
9 - Indicates Check Digit.
10 - Indicates Model Year.
11 - Indicates Assembly Plant.
12-17 - Indicates Production Sequence.

VIN DEFINITION (NAVAJO ONLY)

(VIN)	4	F	2	C	U	4	4	X	*	P	U	M	0	0	0	0	1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

1 - Indicates Manufacturer.
2 - Indicates Make.
3 - Indicates Vehicle Type.
4 - Indicates Brake System/GVWR.
5-7 - Indicates Model or Line/Series/Chassis/Cab Type.
8 - Indicates Engine Type.
9 - Indicates Check Digit.
10 - Indicates Model Year.
11 - Indicates Assembly Plant.
12 - Indicates Mazda.
13-17 - Indicates Production Sequence.

MODEL YEAR VIN CODE APPLICATION TABLE

VIN Code	Model Year

```
M  .........................................  1991
N  .........................................  1992
P  .........................................  1993
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
```

ENGINE CODE LOCATION

NOTE: Engine code location for Navajo not available from manufacturer.

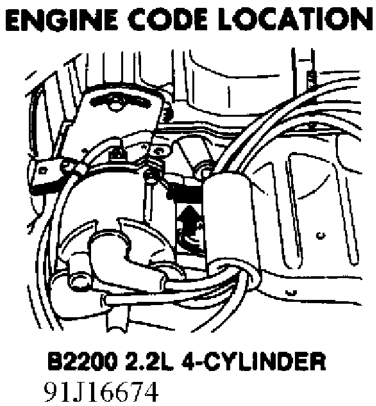


Fig. 1: Engine Code Location (B2200 2.2L 4-Cyl.)
Courtesy of Mazda Motors Corp.

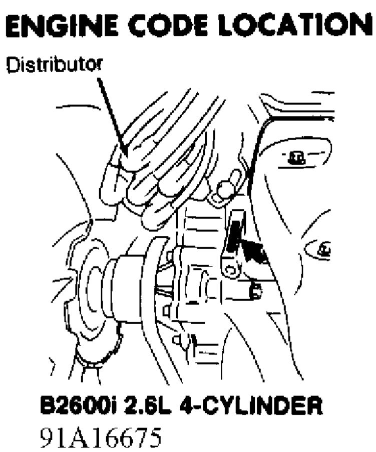


Fig. 2: Engine Code Location (B2600i 2.5L 4-Cyl.)
Courtesy of Mazda Motors Corp.

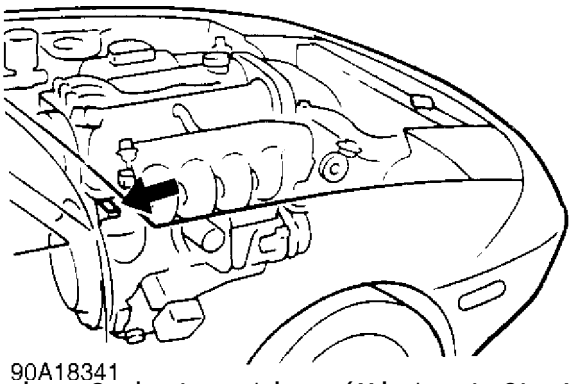


Fig. 3: Engine Code Location (Miata 1.6L 4-Cyl.)
Courtesy of Mazda Motors Corp.

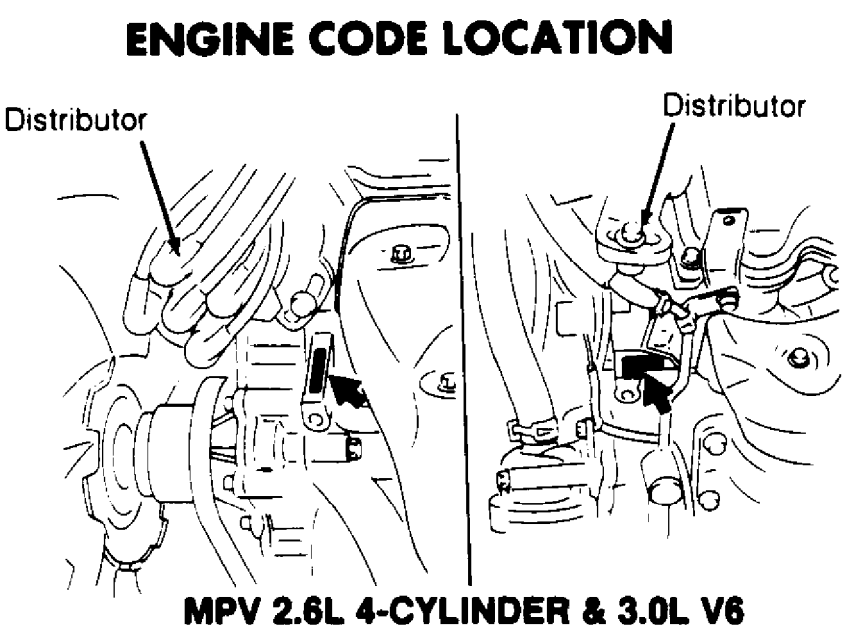


Fig. 4: Engine Code Location (MPV 2.6L 4-Cyl. & 3.0L V6)
Courtesy of Mazda Motors Corp.

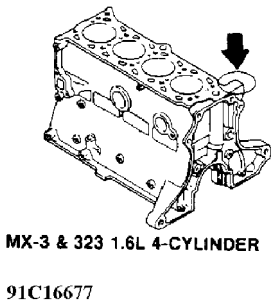


Fig. 5: Engine Code Location (MX-3 & 323 1.6L 4-Cyl.)
Courtesy of Mazda Motors Corp.

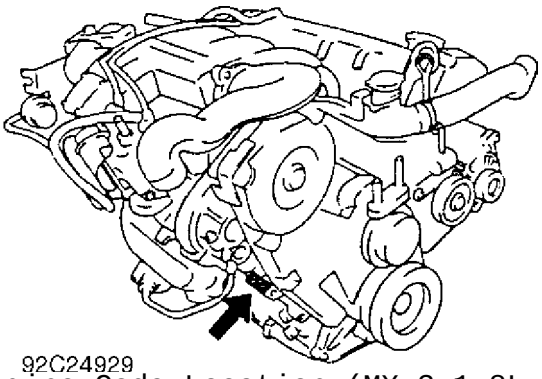


Fig. 6: Engine Code Location (MX-3 1.8L V6 & MX-6 & 626 2.5L V6)
Courtesy of Mazda Motors Corp.

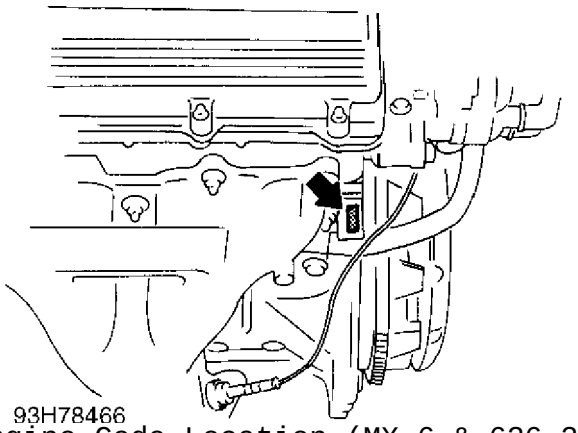


Fig. 7: Engine Code Location (MX-6 & 626 2.0L 4-Cyl. & Protoge 1.
8L 4-Cyl.)
Courtesy of Mazda Motors Corp.

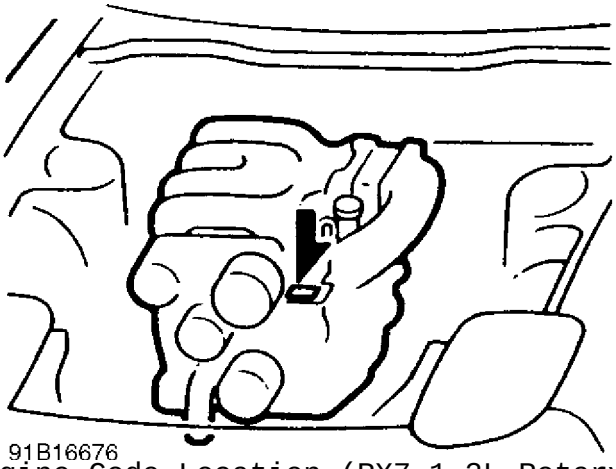


Fig. 8: Engine Code Location (RX7 1.3L Rotary)
Courtesy of Mazda Motors Corp.

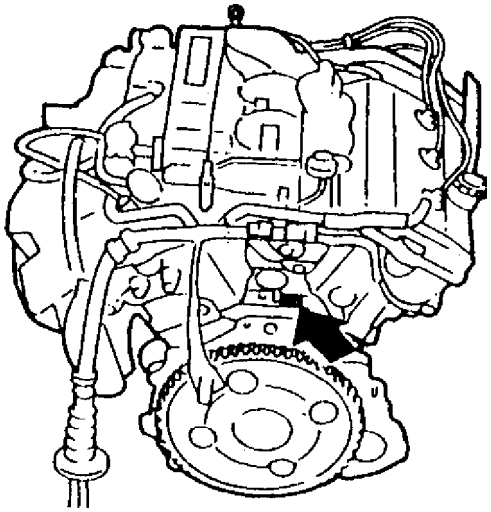


Fig. 9: Engine Code Location (929 3.0L V6)
Courtesy of Mazda Motors Corp.

END OF ARTICLE

B - EMISSION APPLICATION
Article Text

1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 06:36AM

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda Emission Applications

B2200, B2600i, Miata, MPV, MX-3, MX-6, Navajo, Protege, RX7, 323, 626, 929

EMISSION APPLICATIONS

EMISSION APPLICATIONS TABLE

Engine & Fuel System	Emission Control Systems & Devices
B2200	
2.2L 4-Cyl. 2-Bbl.	
Major Control Systems & Devices	PCV, TAC, EVAP, (1) TWC, FR, EGR, SPK, PAIR, O2, CEC, EFE, MIL
Components & Other Related Devices	EGR-PS, EVAP-VC, EVAP-CKV, EVAP-CPCS, SPK-VSV
2.2L 4-Cyl. PFI	
Major Control Systems & Devices	PCV, EVAP, TWC, FR, SPK, O2, CEC, MIL
Components & Other Related Devices	EVAP-VC, EVAP-CKV, EVAP-CPCS, SPK-CC
B2600i	
2.6L 4-Cyl. PFI	
Major Control Systems & Devices	PCV, EVAP, TWC, FR, SPK, O2, CEC, MIL
Components & Other Related Devices	EVAP-VC, EVAP-CKV, EVAP-CPCS, SPK-CC
Miata	
1.6L 4-Cyl. PFI	
Major Control Systems & Devices	PCV, EVAP, TWC, FR, SPK, O2, CEC, MIL
Components & Other Related Devices	EVAP-VC, EVAP-CPCS, SPK-CC
MPV	
2.6L 4-Cyl. PFI	
Major Control Systems & Devices	PCV, EVAP, TWC, FR, O2, CEC, MIL
Components & Other Related Devices	EVAP-VC, EVAP-CKV, SPK-CC
3.0L V6 PFI	
Major Control Systems & Devices	PCV, EVAP, TWC, FR, (2) O2, CEC, MIL
Components & Other Related Devices	EVAP-VC, EVAP-CKV, SPK-CC

MX-3
1.6L 4-Cyl. & 1.8L V6 SFI
Major Control Systems & Devices ..... PCV, EVAP, TWC, FR, (3) EGR, SPK, O2, CEC, MIL
Components & Other Related Devices ..... (3) EGR-VSV, (3) EGR-PS, EVAP-VC, EVAP-CPCS, SPK-CC

MX-6 & 626
2.0L 4-Cyl. SFI
Major Control Systems & Devices ..... PCV, EVAP, TWC, FR, EGR, SPK, (2) O2, CEC, MIL
Components & Other Related Devices ..... EVAP-VC, EVAP-CKV, EVAP-CPCS, EGR-VSV, (4) EGR-PS, SPK-CC
2.5L V6 SFI
Major Control Systems & Devices ..... PCV, EVAP, TWC, FR, EGR, SPK, (2) O2, CEC, MIL
Components & Other Related Devices ..... EVAP-VC, EVAP-CKV, EVAP-CPCS, EGR-VSV, EGR-PS, SPK-CC

Navajo
4.0L V6 SFI
Major Control Systems & Devices ..... PCV, TAC, EVAP, TWC, FR, (4) BP/EGR, SPK, (2) O2, CEC, MIL
Components & Other Related Devices ..... (4) BP/EGR-EET, (4) BP/EGR-VRV, EVAP-VC, EVAP-CPCS, SPK-CC

Protege
1.8L 4-Cyl. SFI
Major Control Systems & Devices ..... PCV, EVAP, TWC, FR, SPK, O2, CEC, MIL
Components & Other Related Devices ..... EVAP-VC, EVAP-CPCS, SPK-CC

RX7
1.3L Rotary PFI
Major Control Systems & Devices ..... PCV, EVAP, (1) TWC, FR, EGR, SPK, (5) AP, O2, CEC, MIL
Components & Other Related Devices ..... AP-DV, EGR-SOL, (4) EGR-PS, EVAP-CKV, EVAP-VC, EVAP-CPCS, SPK-CC

323
1.6L 4-Cyl. PFI
Major Control Systems & Devices ..... PCV, EVAP, TWC, FR, SPK, O2, CEC, MIL
Components & Other Related Devices ... EVAP-VC, EVAP-CPCS, SPK-CC

929

3.0L V6 SFI
Major Control Systems & Devices ..... PCV, EVAP, (1) TWC, FR, EGR, SPK, (2) O2, CEC, MIL
Components & Other Related Devices ..... EGR-VSV, EGR-PS, EVAP-VC, EVAP-CKV, EVAP-CPCS, SPK-CC

(1) - Engine uses 2 catalysts.
(2) - Heated oxygen sensor.
(3) - V6 engines only.
(4) - California models only.
(5) - Air pump includes magnetic clutch.

ABBREVIATION DEFINITIONS

ABBREVIATION DEFINITION TABLE

Abbreviation	Definition
AP	Air Pump Injection System
AP-DV	AP Diverter Valve
BP/EGR	Backpressure EGR System
BP/EGR-EET	BP/EGR Electric Transducer
BP/EGR-VRV	BP/EGR Vacuum Regulator Valve
CEC	Computerized Engine Controls
EFE	Early Fuel Evaporation
EGR	Exhaust Gas Recirculation
EGR-PS	EGR Position Sensor
EGR-SOL	EGR Solenoid
EGR-VSV	EGR Vacuum Switching Valve
EVAP	Evaporative Emission Control
EVAP-CKV	EVAP Check Valve
EVAP-CPCS	EVAP Canister Purge Control Solenoid
EVAP-VC	EVAP Vapor Canister
FR	Fill Restrictor
MIL	Malfunction Indicator Light
O2	Oxygen Sensor
PAIR	Pulsed Secondary Air Injection
PCV	Positive Crankcase Ventilation
PFI	Port Fuel Injection
SFI	Sequential Fuel Injection
SPK	Spark Controls
SPK-CC	SPK Computer Controlled
SPK-VSV	SPK Vacuum Switching Valve
TAC	Thermostatic Air Cleaner
TWC	Three-Way Catalyst

END OF ARTICLE

C - SPECIFICATIONS
Article Text
1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 06:37AM

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda Service & Adjustment Specifications

B2200, B2600i, Miata, MPV, MX-3, MX-6,
Navajo, Protege, RX7, 323, 626, 929

INTRODUCTION

Use this article to quickly find specifications related to servicing and on-vehicle adjustments. This is a quick-reference article to use when you are familiar with an adjustment procedure and only need a specification.

CAPACITIES

BATTERY SPECIFICATIONS

Application	Amp Hr. Rating
B2200 & B2600i	
Standard	50
Heavy Duty	75 or 80
Miata	32
MPV	
Standard	50
Heavy Duty	65
MX-3	
4-Cyl.	
Standard	50
Heavy Duty	55
V6	65
MX-6	58
Navajo	72
Protege	50
RX7	
Standard	48
Heavy Duty	55
323	50
626	58
929	
Standard	48
Heavy Duty	55

FLUID CAPACITIES

Application	Quantity
Crankcase (Includes Filter)	

B2200	4.3 Qts. (4.1L)
B2600i	5.0 Qts. (4.7L)
Miata	3.6 Qts. (3.4L)
MPV	
2.6L	5.0 Qts. (4.7L)
3.0L	5.1 Qts. (4.8L)
MX-3	
1.6L	3.4 Qts. (3.2L)
1.8L	4.2 Qts. (4.0L)
MX-6	
2.0L	3.5 Qts. (3.7L)
2.5L	4.2 Qts. (4.0L)
Navajo	5.0 Qts. (4.7L)
Protege	4.0 Qts. (3.8L)
RX7	
Except R1 Option	5.2 Qts. (4.9L)
R1 Option	5.7 Qts. (5.4L)
323	3.4 Qts. (3.2L)
626	
2.0L	3.5 Qts. (3.7L)
2.5L	4.2 Qts. (4.0L)
929	5.3 Qts. (5.0L)
Cooling System (Includes Heater)	
B2200	7.9 Qts. (7.5L)
B2600i	7.9 Qts. (7.5L)
Miata	6.3 Qts. (6.0L)
MPV	
2.6L	7.6 Qts. (7.2L)
3.0L	10.3 Qts. (9.7L)
MX-3	
1.6L	6.3 Qts. (6.0L)
1.8L	7.9 Qts. (7.5L)
MX-6	
2.0L	7.4 Qts. (7.4L)
2.5L	7.9 Qts. (7.5L)
Navajo	
With A/C	8.6 Qts. (8.1L)
Without A/C	7.8 Qts. (7.4L)
Protege	
Auto. Trans.	6.3 Qts. (6.0L)
Manual Trans.	5.3 Qts. (5.0L)
RX7	9.2 Qts. (8.7L)
626	
2.0L	7.4 Qts. (7.4L)
2.5L	7.9 Qts. (7.5L)
323	
Auto. Trans.	6.3 Qts. (6.0L)
Manual Trans.	5.3 Qts. (5.0L)
929	9.9 Qts. (9.4L)
Manual Transaxle	
MX-3 (1)	2.8 Qts. (2.6L)
MX-6 (4)	2.9 Qts. (2.7L)

Protege	
DOHC (3)	3.6 Qts. (3.4L)
SOHC (2)	2.8 Qts. (2.6L)
323 (2)	2.8 Qts. (2.6L)
626 (4)	2.9 Qts. (2.7L)
Manual Transmission (4)	
B2200 5-Spd.	2.1 Qts. (2.0L)
B2600i (3)	
2WD	3.0 Qts. (2.8L)
4WD	3.4 Qts. (3.2L)
Miata	2.1 Qts. (2.0L)
MPV	2.6 Qts. (2.5L)
Navajo	2.8 Qts. (2.6L)
RX7	2.6 Qts. (2.5L)
Automatic Transaxle (ATF Dexron-II) (5)	
MX-3	
1.6L	6.7 Qts. (6.3L)
1.8L	6.1 Qts. (5.8L)
MX-6	9.3 Qts. (8.8L)
Protege	6.1 Qts. (5.8L)
323	6.1 Qts. (5.8L)
626	9.3 Qts. (8.8L)
Automatic Transmission (ATF M-III or Dexron-II)	
B2200, B2600i, Miata, MPV, RX7 & 929	4.2 Qts. (4.0L)
Navajo	3.0 Qts. (2.8L)
Front Differential (6)	
B2600i	1.6 Qts. (1.5L)
MPV	1.8 Qts. (1.7L)
Navajo	1.7 Qts. (1.6L)
Rear Differential (6)	
B2200	1.3 Qts. (1.2L)
B2600i	1.8 Qts. (1.7L)
Miata	.69 Qts. (.65L)
MPV	1.6 Qts. (1.5L)
Navajo	2.6 Qts. (2.5L)
RX7	1.4 Qts. (1.3L)
929	1.4 Qts. (1.3L)
Transfer Case (7)	
B2600i	2.1 Qts. (2.0L)
MPV	1.6 Qts. (1.5L)
Navajo	1.3 Qts. (1.2L)

(1) - For all-season conditions, use SAE 75W-90. If temperature is less than 0øF (-18øC), use ATF Dexron-II.
(2) - Use SAE 75W-90.
(3) - For all-season conditions, use SAE 75W-90 or ATF Dexron-II. For temperatures greater than 0øF (-18øC), use SAE 80W-90 or SAE 90.
(4) - On Navajo, use SAE 80W-90 or SAE 75W-90. On other models, use SAE 75W-90 for all-season conditions, and SAE 80W-90 for temperatures greater than 50øF (10øC).
(5) - Specification is total fluid capacity of transaxle, not

refill capacity after pan removal.
(6) - On Navajo, use SAE 90. On all other models, use SAE 90 for temperatures greater than 0øF (-18øC), and SAE 80W for temperatures less than 0øF (-18øC).
(7) - On Navajo, use Mercon ATF. On other models, use SAE 75W-90 or ATF Dexron-II for all-season conditions, and SAE 80W-90 or SAE 90 for temperatures greater than 0øF (-18øC).

QUICK-SERVICE

SERVICE INTERVALS & SPECIFICATIONS

REPLACEMENT INTERVALS

Component	Miles
Air Filter	30,000
Camshaft Timing Belt	60,000
Coolant	30,000
Fuel Filter	
B2200 (Carbureted)	30,000
Navajo	(1)
All Others	60,000
Oil	
Non-Turbo	7500
Turbo	5000
Oil Filter	
Non-Turbo	7500
Turbo	5000
Spark Plugs	
Navajo	60,000
All Others	30,000

(1) - Specification is not available from manufacturer.

BELT ADJUSTMENT (NEW BELT)

Application	Deflection (1) In. (mm)
Alternator	
B2200	9/32 - 5/16 (7-8)
B2600i	25/64 - 15/32 (10-12)
Miata & MX-3 (1.6L)	5/16 - 23/64 (8-9)
MPV	
2.6L	25/64 - 15/32 (10-12)
3.0L	23/64 - 25/64 (9-10)
MX-3	15/64 - 9/32 (6-7)
MX-6 & 626	15/64 - 9/32 (6-7)

Navajo	(2)
Protege & 323	5/16 - 23/64 (8-9)
RX7	9/32 - 5/16 (7-8)
929	25/64 - 15/32 (10-12)
A/C Compressor	
B2200	25/64 - 15/32 (10-12)
B2600i	5/16 - 25/64 (8-10)
Miata & MX-3 (1.6L)	5/16 - 23/64 (8-9)
MPV	
2.6L	5/16 - 25/64 (8-10)
3.0L	11/64 - 13/64 (4.5-5)
MX-3 (1.8L)	15/64 (6)
MX-6 & 626	
2.0L	9/32 - 23/64 (7-9)
2.5L	15/64 - 9/32 (6-7)
Navajo	(2)
Protege & 323	5/16 - 23/64 (8-9)
RX7	11/64 - 13/64 (4.5-5)
929	15/32 - 1/2 (12-13)
Power Steering	
B2200	9/32 - 5/16 (7-8)
B2600i	9/32 (7)
Miata & MX-3 (1.6L)	5/16 - 23/64 (8-9)
MPV	9/32 (7)
MX-3 (1.8L)	15/64 - 9/32 (6-7)
MX-6 & 626	
2.0L	9/32 - 23/64 (7-9)
2.5L	15/64 - 9/32 (6-7)
Navajo	(2)
Protege & 323	5/16 - 23/64 (8-9)
RX7	11/64 - 13/64 (4.5-5)
929	5/16 - 25/32 (8-10)

(1) - Measure belt deflection by applying moderate pressure, about 22 lbs. (10 kg), to belt, midway between pulleys.
(2) - Navajo is equipped with automatic belt tensioner.

MECHANICAL CHECKS

ENGINE COMPRESSION

1) Warm engine to normal operating temperature. Remove all spark plugs. On Navajo, use remote starter switch to crank engine (DO NOT crank engine with ignition switch). On all other models, disconnect ignition coil primary wire connector.
2) On all models, hold throttle plate fully open. Crank engine, and note compression pressure.

COMPRESSION RATIO

Application	Specification

B2200	8.6:1
B2600i	8.4:1
Miata	
Auto. Trans.	9.4:1
Manual Trans.	9.0:1
MPV	
2.6L	8.4:1
3.0L	8.5:1
MX-3	
1.6L	9.0:1
1.8L	9.2:1
MX-6	
2.0L	9.0:1
2.5L	9.2:1
Navajo	9.0:1
Protege	
DOHC	9.0:1
SOHC	8.9:1
RX7	9.0:1
323	
California	9.3:1
Federal	9.0:1
626	
2.0L	9.0:1
2.5L	9.2:1
929	9.2:1

COMPRESSION PRESSURE SPECIFICATIONS

Application	Specifications
Compression Pressure	
B2200	173 psi (12.2 kg/cmý) @ 300 RPM
B2600i	182 psi (12.8 kg/cmý) @ 270 RPM
Miata	192 psi (13.5 kg/cmý) @ 300 RPM
MPV	
2.6L	185 psi (13.0 kg/cmý) @ 280 RPM
3.0L	164 psi (11.5 kg/cmý) @ 300 RPM
MX-3	
1.6L	185 psi (13.0 kg/cmý) @ 300 RPM
1.8L	192 psi (13.5 kg/cmý) @ 300 RPM
MX-6	
2.0L	171 psi (12.0 kg/cmý) @ 300 RPM
2.5L	203 psi (14.3 kg/cmý) @ 250 RPM
Navajo	(1)
Protege	
DOHC	182 psi (12.8 kg/cmý) @ 300 RPM
SOHC	173 psi (12.2 kg/cmý) @ 300 RPM
RX7	100 psi (7.0 kg/cmý) @ 250 RPM
323	192 psi (13.5 kg/cmý) @ 300 RPM

626	
2.0L	171 psi (12.0 kg/cmý) @ 300 RPM
2.5L	203 psi (14.3 kg/cmý) @ 250 RPM
929	213 psi (15.0 kg/cmý) @ 270 RPM
Minimum Compression Pressure	
B2200	121 psi (8.5 kg/cmý) @ 300 RPM
B2600i	142 psi (10.0 kg/cmý) @ 280 RPM
Miata	135 psi (9.5 kg/cmý) @ 300 RPM
MPV	
2.6L	142 psi (10.0 kg/cmý) @ 280 RPM
3.0L	121 psi (8.5 kg/cmý) @ 300 RPM
MX-3	142 psi (10.0 kg/cmý) @ 300 RPM
MX-6	
2.0L	119 psi (8.4 kg/cmý) @ 300 RPM
2.5L	142 psi (10.0 kg/cmý) @ 250 RPM
Navajo	(1)
Protege	
DOHC	128 psi (9.0 kg/cmý) @ 300 RPM
SOHC	121 psi (8.5 kg/cmý) @ 300 RPM
RX7	79 psi (5.5 kg/cmý) @ 250 RPM
323	135 psi (9.5 kg/cmý) @ 300 RPM
626	
2.0L	119 psi (8.4 kg/cmý) @ 300 RPM
2.5L	142 psi (10.0 kg/cmý) @ 250 RPM
929	157 psi (11.0 kg/cmý) @ 270 RPM
Maximum Variation Between Cylinders	
Miata, Protege & 323	28 psi (2.0 kg/cmý)
Navajo	(1)
RX7	21 psi (1.5 kg/cmý)
All Others	(2)

(1) - Measurement of lowest cylinder must be within 75 percent of highest cylinder.
(2) - Information is not available from manufacturer.

VALVE CLEARANCE

NOTE: All piston engines are equipped with hydraulic valve lash adjusters. Valve clearance is not adjustable.

IGNITION SYSTEM

IGNITION COIL

IGNITION COIL RESISTANCE - Ohms @ 68øF (20øC)

Application	Primary	Secondary
B2200		
Carbureted	1.0-1.3	6000-30,000
PFI	.81-.99	6000-30,000

B2600i	.81-.99	.....	6000-30,000
Miata	.78-.94	.....	11,200-15,200
MPV			
2.6L (4-Cyl.)			
Right Side	.77-.95	.....	6000-30,000
Left Side	900-1100	.....	N/A
3.0L (V6)	.81-.99	.....	6000-30,000
MX-3			
1.6L	.81-.99	.....	10,300-16,000
1.8L	.58-.86	.....	11,500-18,500
MX-6 & 626	.58-.86	.....	11,500-18,500
Navajo	.5	.....	(1)
Protege & 323	.81-.99	.....	10,000-16,000
RX7			
Leading	0-1.0	.....	9600-16,000
Trailing	0-1.0	.....	Infinity
929			
Left Side	.77-1.0	.....	9000-17,000
Right Side	900-1100	.....	N/A

(1) - Information is not available from manufacturer.

DISTRIBUTOR SENSORS

NOTE: For models not listed in tables, see BASIC DIAGNOSTIC PROCEDURES article for crank angle sensor testing.

DISTRIBUTOR PICK-UP COIL RESISTANCE (1)

Application	Ohms
B2200 (Carbureted)	900-1200
MPV 3.0L	
Check Ignitor Terminals	
"COM" & "Ne"	205-255
"COM" & "G1"	205-255
"COM" & "G2"	205-255

(1) - Other distributors use LED or Hall-Effect sensors.

CRANK ANGLE SENSOR RESISTANCE

Application	Ohms
MX-3 1.8L (At Crankshaft Pulley)	520-580
MX-6 & 626 2.5L (At Crankshaft Pulley)	520-580
RX7 (At Crankshaft Pulley)	950-1250
929 (At Crankshaft Pulley)	950-1250

HIGH TENSION WIRE RESISTANCE

High tension wire resistance should not exceed 4900 ohms per foot (7000 ohms per foot on Navajo).

SPARK PLUGS

SPARK PLUG TYPE

Application	NGK No.
B2200	
Carbureted	BPR5ES or BPR6ES
PFI	BPR5ES-11 or BPR6ES-11
B2600i	ZFR5F-11 or ZFR6F-11
Miata	BKR5E-11, BKR6E-11 or BKR7E-11
MPV	ZFR5F-11 or ZFR6F-11
MX-3	BPR5ES-11 or BPR6ES-11
MX-6 & 626	
2.0L	BKR5E-11 or BKR6E-11
2.5L	ZFR5F-11 or ZFR6F-11
Navajo	(1)
Protege DOHC	BKR5E-11, BKR6E-11 or BKR7E-11
Protege SOHC	BKR5E-11 or BKR6E-11
RX7	
Leading	BUR7E-QP
Trailing	BUR9E-QP
323	
California	BPR5ES-11 or BPR6ES-11
Federal	BKR5E-11 or BKR6E-11
929	BKR5EVX-11 or BKR6EVX-11

(1) - Use Motorcraft spark plug number AWSF-42PP.

SPARK PLUG SPECIFICATIONS

Application	Gap In. (mm)	Torque Ft. Lbs. (N.m)
B2200 (Carbureted)	.031 (.80)	13 (18)
Navajo	.054 (1.4)	13 (18)
RX7	(1) .044-.066 (1.1-1.7)	13 (18)
All Others	.041 (1.0)	13 (18)

(1) - Gap is not adjustable.

FIRING ORDER & TIMING MARKS

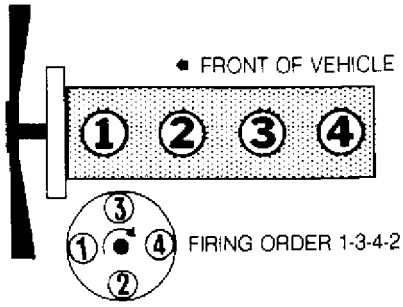


Fig. 1: Firing Order & Distributor Rotation (B2200, B2600i & MPV 2.6L)

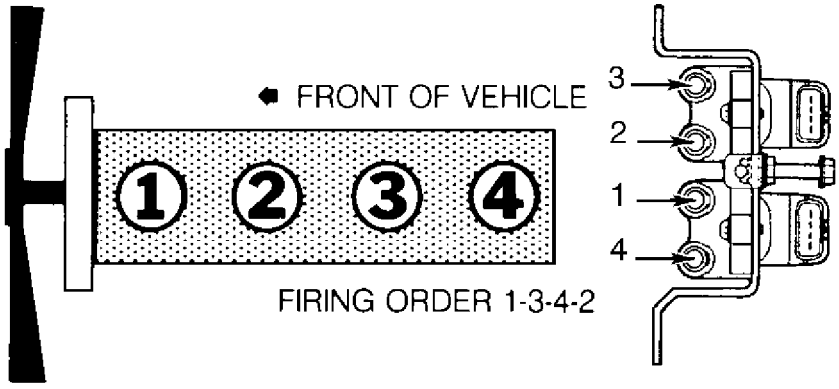


Fig. 2: Firing Order (Miata)

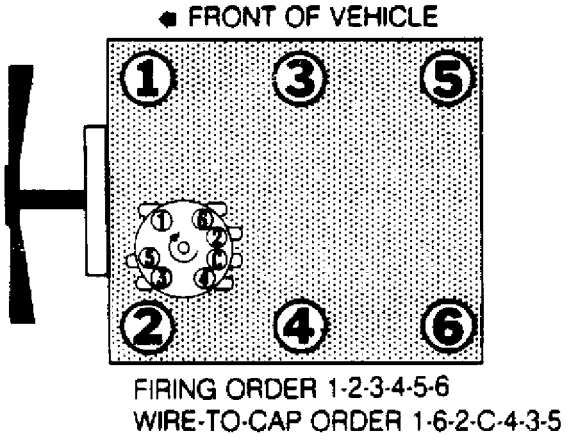


Fig. 3: Firing Order & Distributor Rotation (MPV 3.0L & 929)

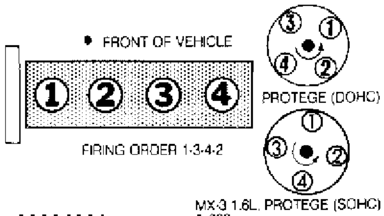


Fig. 4: Firing Order & Distributor Rotation (MX-3 1.6L, Protege & 323)

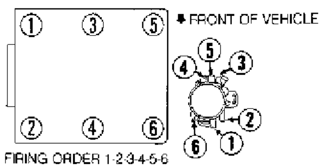


Fig. 5: Firing Order & Distributor Rotation (MX-3 1.8L, MX-6 2.5L & 626 2.5L)

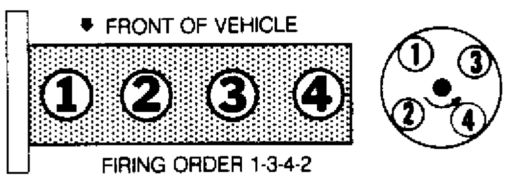


Fig. 6: Firing Order & Distributor Rotation (MX-6 & 626 2.0L)

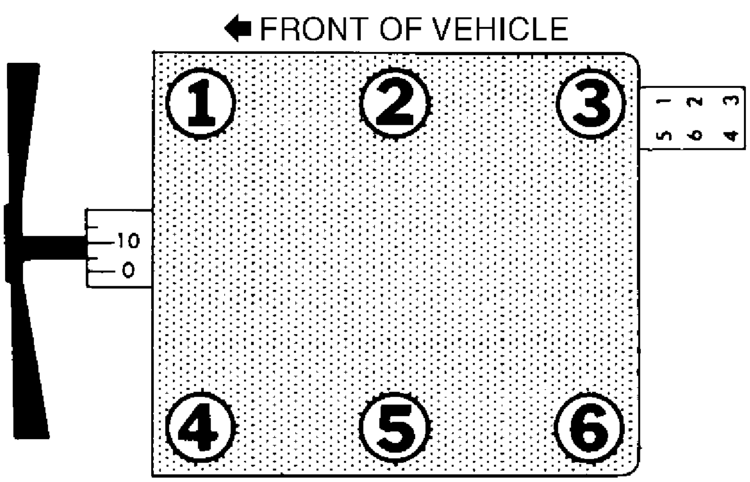


Fig. 7: Firing Order & Coil Pack (Navajo)

IGNITION TIMING

IGNITION TIMING SPECIFICATIONS (Degrees BTDC @ RPM)
ÄÄÄ

Application	Man. Trans.	(1) Auto. Trans.
B2200		
Carbureted	6 @ 825	6 @ 825
PFI (2)	6 @ 750	6 @ 770
B2600i (2)	5 @ 750	5 @ 770
Miata (3)	10 @ 850	8 @ 850
MPV		
2.6L (2)	N/A	5 @ 770
3.0L (2)	N/A	11 @ 800
MX-3		
1.6L (3)	10 @ 750	10 @ 750
1.8L (3)	10 @ 670	10 @ 670
MX-6 & 626		
2.0L (3)	12 @ 700	12 @ 700
2.5L (3)	10 @ 650	10 @ 650
Navajo	(4)	(4)
Protege		
DOHC (3)	10 @ 750	10 @ 750
SOHC (3)	5 @ 750	5 @ 750
RX7		
Leading (3)	(5) 5 @ 725	(5) 5 @ 725
Trailing (3)	(5) 20 @ 725	(5) 20 @ 725
323 (3)	7 @ 750	7 @ 750
929 (3)	N/A	12 @ 700

(1) - Place automatic transmission in Park.
(2) - Connect jumper wire between Green test connector and ground.
(3) - Connect jumper wire between terminals TEN and GRN of diagnostic connector.
(4) - Base (initial) timing is preset at 10 degrees BTDC and is not adjustable. To check timing, see appropriate D - ADJUSTMENTS article.
(5) - Timing specification is AFTER TDC and is not adjustable.

DISTRIBUTOR SPECIFICATIONS

NOTE: On models with computer-controlled ignition, see appropriate G - TESTS W/CODES article to diagnose ignition timing problems.

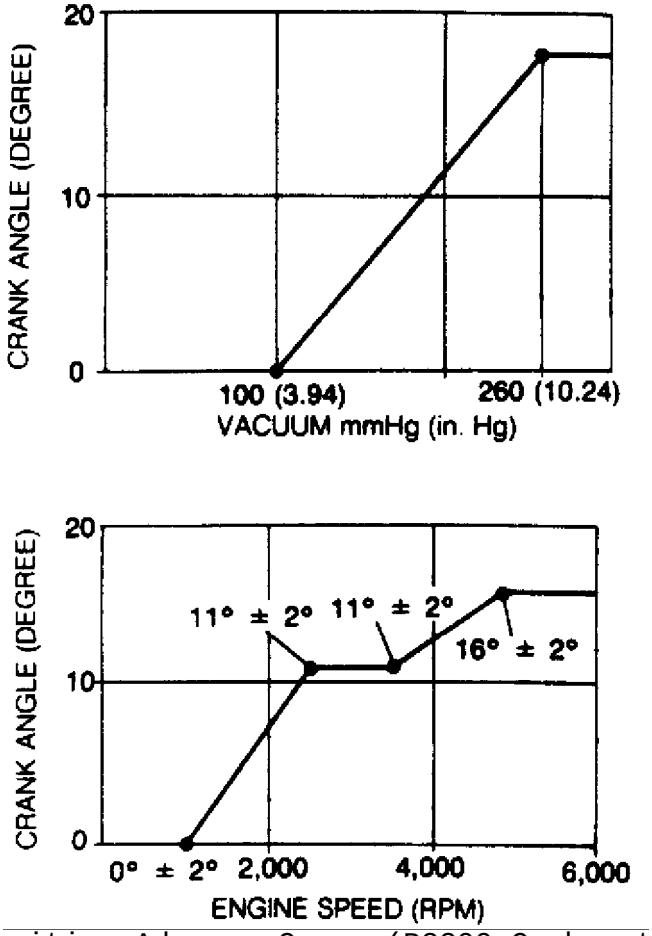


Fig. 8: Ignition Advance Curve (B2200 Carbureted)
Courtesy of Mazda Motors Corp.

FUEL SYSTEM

FUEL PUMP

NOTE: Fuel pump performance measures fuel pressure and volume availability, not regulated fuel pressure.

FUEL PUMP PERFORMANCE

Application	Pressure psi (kg/cmý)	Min. Vol. In 30 Sec. Pts. (L)
B2200 (Carbureted)		
Electric Pump	2.8-3.6 (.20-.25)	1.1 (.66)
Mechanical Pump	3.7-4.7 (.26-.33)	.9 (.43)
Navajo	(1)	.95 (.49)
MX-6 & 626 (2.5L)	72-92 (5.5-6.5)	(1)
All Others	64-92 (4.5-6.5)	(1)

(1) - Information is not available from manufacturer.

REGULATED FUEL PRESSURE

Application	At Idle W/ Vacuum psi (kg/cm²)	At Idle W/O Vacuum psi (kg/cm²)
B2200 (PFI) & B2600i	28-37 (2.0-2.6)	38-46 (2.7-3.2)
Miata, MX-6 & 626	31-38 (2.2-2.7)	38-46 (2.7-3.2)
MPV	30-37 (2.1-2.6)	38-46 (2.7-3.2)
MX-3, Protege & 323	30-37 (2.1-2.6)	38-46 (2.7-3.2)
RX7	27-32 (1.9-2.3)	36-38 (2.5-2.7)
Navajo	(1)	(2)
929	31-38 (2.2-2.7)	38-46 (2.7-3.2)

(1) - Pressure should be 30-45 psi (2.2-3.2 kg/cm²) with engine running and 35-45 psi (2.5-3.2 kg/cm²) with ignition on and engine off.
(2) - Information is not available from manufacturer.

INJECTOR RESISTANCE

INJECTOR RESISTANCE

Application	Ohms
Navajo	13-16
Except Navajo	12-16

IDLE SPEED & MIXTURE

IDLE SPEED SPECIFICATIONS

Application	Man. Trans. RPM	(1) Auto. Trans. RPM
B2200		
Carbureted	825	825
PFI (2)	750	770
B2600i (2)	750	770
Miata (3)	850	850
MPV		
2.6L (2)	750	770
3.0L (2)	800	800
MX-3 (3)		
1.6L	750	750
1.8L	670	670
MX-6 & 626 (3)		
2.0L	700	700

2.5L	650	650
Navajo	(4)	(4)
Protege (3)	750	750
RX7 (3)	725	725
323 (3)	750	750
929 (3)	N/A	700

(1) - Place automatic transmission in Park.
(2) - Connect jumper wire between Green test connector and ground.
(3) - Connect jumper wire between terminals TEN and GRN of diagnostic connector.
(4) - Idle speed is not adjustable, however, throttle angle (minimum air rate) can be set using special procedure. See D - ADJUSTMENTS article.

FAST (COLD) IDLE SPEED

FAST (COLD) IDLE SPEED

Application	RPM
B2200 (Carbureted)	(1) 3000-4000
RX7	(2) Not Adjustable

(1) - Adjust with throttle lever on highest step of fast idle cam.
(2) - See D - ADJUSTMENTS article for checking procedure.

DASHPOT SPECIFICATIONS

DASHPOT SPECIFICATIONS (1)

Application	RPM
B2200 (Carbureted M/T)	2700-2900
Miata	2350-2650
MPV (3.0L)	3200-3800
MX-3 (1.6L)	About 3000
Protege	
DOHC	About 3500
SOHC	About 2700
RX7	2600-3000
323	About 3000

(1) - See D - ADJUSTMENTS article.

THROTTLE POSITION (TP) SENSOR

NOTE: For information on connector terminal identification and test conditions specified in the following tables, see D - ADJUSTMENTS article.

NOTE: Throttle position sensor on MX-6 2.0L and 626 2.0L is not adjustable.

TP SENSOR VOLTAGE - B2200 PFI, B2600i & MPV 2.6L

Red Wire Volts	Blue Wire (1) Volts	(2) Blue Wire Volts
4.50-4.59	.37-.54	3.58-4.23
4.60-4.69	.38-.55	3.66-4.32
4.70-4.79	.39-.56	3.74-4.41
4.80-4.89	.40-.57	3.82-4.51
4.90-4.99	.40-.58	3.90-4.60
5.00-5.09	.41-.60	3.97-4.70
5.10-5.19	.42-.61	4.05-4.79
5.20-5.29	.43-.62	4.13-4.88
5.30-5.39	.44-.63	4.21-4.98
5.40-5.49	.44-.64	4.29-5.07
5.50	.44-.66	4.29-5.17

(1) - Closed throttle.
(2) - Wide Open Throttle.

TP SENSOR CONTINUITY - MIATA, MX-3 1.6L, PROTEGE & 323 - A/T

Test Condition (1)	(2) Continuity
.004" (.1 mm)	Yes
.024" (.6 mm)	No

(1) - Insert feeler gauge of specified thickness between throttle lever and throttle stop screw.
(2) - Check continuity with ohmmeter connected between TP sensor terminals "E" and IDL.

TP SENSOR CONTINUITY - MIATA, MX-3 1.6L, PROTEGE & 323 - M/T

Test Condition	Continuity Between IDL & TL/E	Continuity Between POW & TL/E
Miata		
.016" (.4 mm) (1)	Yes	No
.027" (.7 mm) (1)	No	No
Wide Open Throttle	No	Yes
MX-3, Protege & 323		
.004" (.10 mm) (1)	Yes	No

.039" (1.0 mm) (1)	No	No
Wide Open Throttle	No	Yes

(1) - Insert feeler gauge of specified thickness between throttle lever and throttle stop screw.

TP SENSOR CONTINUITY - MX-3 1.8L, MX-6 2.5L & 626 2.5L

Test Condition (1)	(2) Continuity
.006" (.15 mm)	Yes
.020" (.5 mm)	No

(1) - Insert feeler gauge of specified thickness between throttle lever and throttle stop screw.
(2) - Check continuity with ohmmeter connected between TP sensor terminals "E" and IDL.

TP SENSOR RESISTANCE - MPV 3.0L & 929

Test Condition	Ohms
MPV 3.0L	
Between Terminals "A" & "D"	3000-6000
Between Terminals "B" & "D"	
Closed Throttle	About 1000 Or Less
Wide Open Throttle	3000-6000
929	
Between Terminals "A" & "D"	3000-6000
Between Terminals "B" & "D"	
Closed Throttle	200-600
Wide Open Throttle	3300-7000

TP SENSOR ADJUSTMENT - MPV 3.0L & 929

Test Condition (1)	Continuity Between Terminals "C" & "D"
MPV 3.0L	
.020" (.5 mm)	Yes
.028" (.7 mm)	No
929	
.004" (.1 mm)	Yes
.008" (.2 mm)	No

(1) - Insert feeler gauge of specified thickness between throttle lever and throttle stop screw.

TP SENSOR RESISTANCE - NAVAJO

Test Condition (1)	Ohms
Throttle Closed	(2) 500-1200

(1) - Check resistance between Gray/Red wire and Gray/White wire terminals.
(2) - TP sensor is not adjustable.

TP SENSOR VOLTAGE - RX7

Wire Color To Ground	Closed Throttle Volts	Wide Open Throttle Volts
Green/Red (3F) (1)	.75-1.25	4.8-5.0
Black/Green (3G) (1)	0.7-1.0	4.2-4.6

(1) - PCM terminal pin No. in parentheses.

THROTTLE (IDLE) SWITCH

THROTTLE (IDLE) SWITCH VOLTAGE - B2200 CARBURETED

RPM	Volts
825 (Idle)	About 12
1000-1200	Less Than 1.5

END OF ARTICLE

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda On-Vehicle Adjustments

B2200, B2600i, Miata, MPV, MX-3,
MX-6, Navajo, Protege, RX7, 323, 626, 929

ENGINE MECHANICAL

Before performing any on-vehicle adjustments to fuel or ignition systems, ensure engine mechanical condition is okay.

VALVE CLEARANCE

NOTE: All piston engines are equipped with hydraulic valve lash adjusters. No adjustments are required.

IGNITION TIMING

NOTE: Before adjusting ignition timing, warm engine to normal operating temperature. Turn off all accessories. Place transmission in Neutral (M/T) or Park (A/T). Ensure idle speed is correct. See IDLE SPEED under IDLE SPEED & MIXTURE. If timing is not within specification, loosen distributor or Crank Angle Sensor (CAS) lock bolt (Miata only). Rotate distributor or CAS until timing marks are aligned. Tighten lock bolt.

B2200 & B2600i
On B2200 (PFI) and B2600i, connect jumper wire between ground and Green test connector in right rear corner of engine compartment. See Fig. 2. On all models, connect timing light. Set timing to specification. See IGNITION TIMING SPECIFICATIONS table. See Fig. 1. On B2200 (PFI) and B2600i, remove jumper wire.

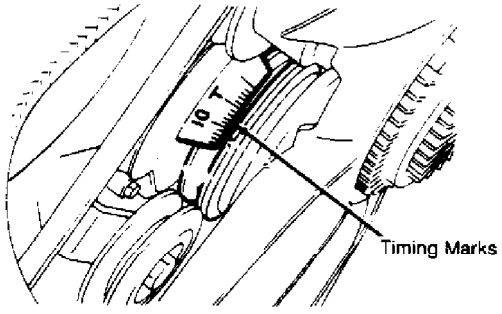
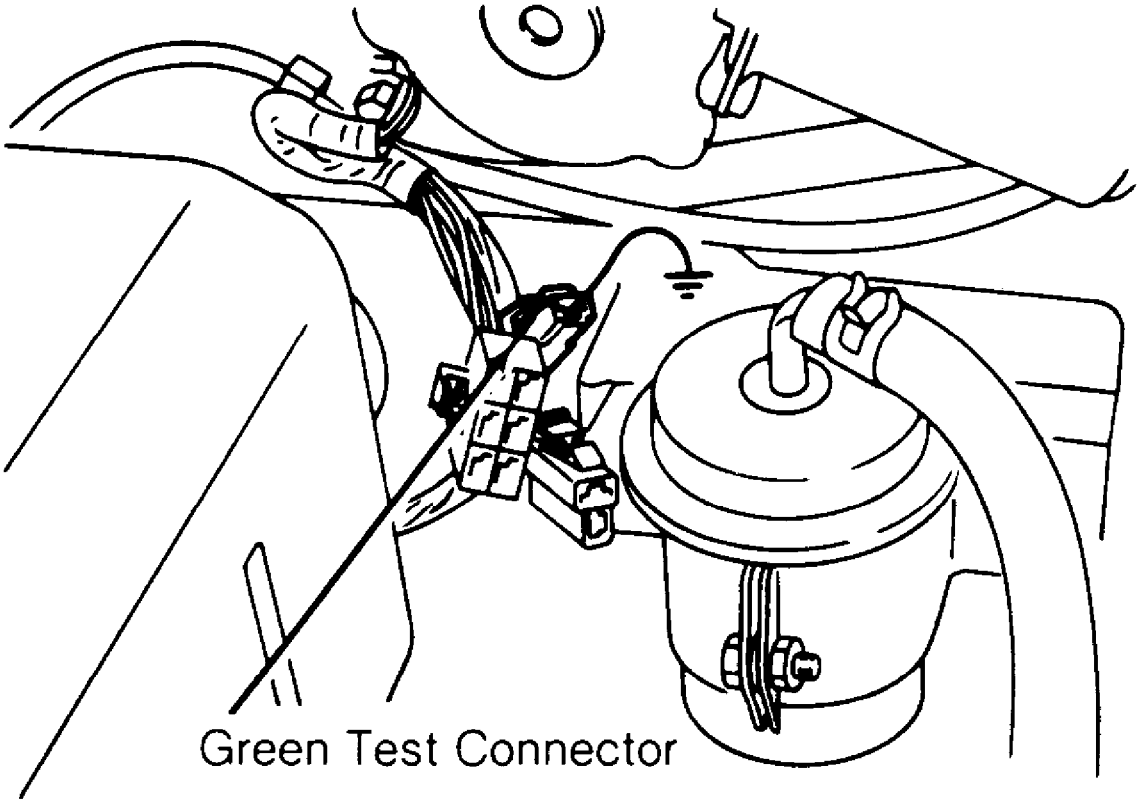


Fig. 1: Locating Ignition Timing Marks (Typical)
Courtesy of Mazda Motors Corp.



201165

Fig. 2: Locating Green Test Connector (B2200 & B2600i)
Courtesy of Mazda Motors Corp.

NOTE: On Miata, use Blue 1-pin connector near airflow meter as a source of battery power for positive lead of tachometer or timing light (battery is in trunk). DO NOT ground this connector, or 20-amp WIPER fuse will blow.

Miata, MX-3, MX-6, Protege, RX7, 323, 626 & 929

1) Connect Diagnostic Tester (49 B019 9A0) to diagnostic connector and select SELF-TEST mode (position 1), or connect jumper wire between diagnostic connector terminals TEN and GND. See Fig. 3.

2) Connect timing light. Set timing to specification (except RX7). See IGNITION TIMING SPECIFICATIONS table. See Fig. 1. On RX7, if ignition timing is not within specifications, see TROUBLE SHOOTING -NO CODES and appropriate SELF-DIAGNOSTICS articles. Disconnect diagnostic tester or jumper wire from diagnostic connector.

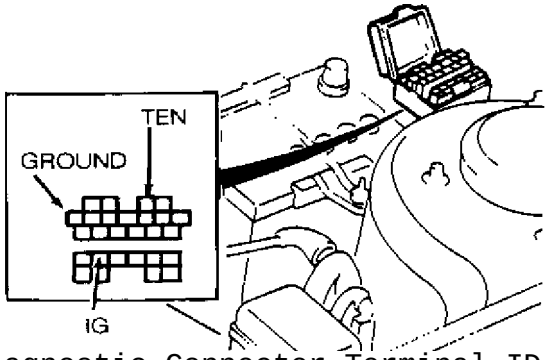


Fig. 3: Diagnostic Connector Terminal ID (Miata, MX-3, MX-6, Protege, RX7, 323, 626 & 929)
Courtesy of Mazda Motors Corp.

MPV

Connect jumper wire between ground and Green test connector in left front corner of engine compartment. See Fig. 4 or 5. Connect timing light. Set timing to specification. See IGNITION TIMING SPECIFICATIONS table. See Fig. 1. Remove jumper wire.

Navajo

1) Engine is equipped with a distributorless ignition. Base (initial) timing is preset at 10 degrees BTDC and is not adjustable. To check base timing, turn ignition off.

2) Disconnect SPOUT in-line connector in Yellow/Light Green wire near Ignition Control Module (ICM), in right front corner of engine compartment. Start engine.

3) Connect timing light and check timing. If ignition timing is not at 10 degrees BTDC, see TROUBLE SHOOTING - NO CODES and appropriate SELF-DIAGNOSTICS articles. Turn off engine. Connect SPOUT in-line connector.

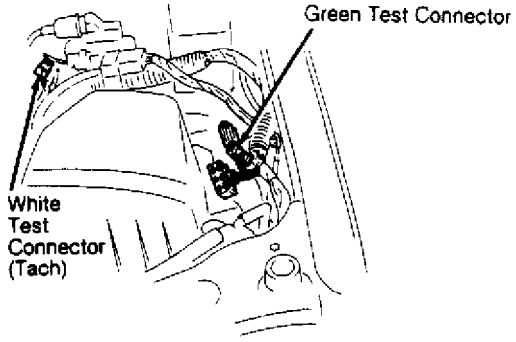


Fig. 4: Locating Green & White Test Connectors (MPV 2.6L)
Courtesy of Mazda Motors Corp.

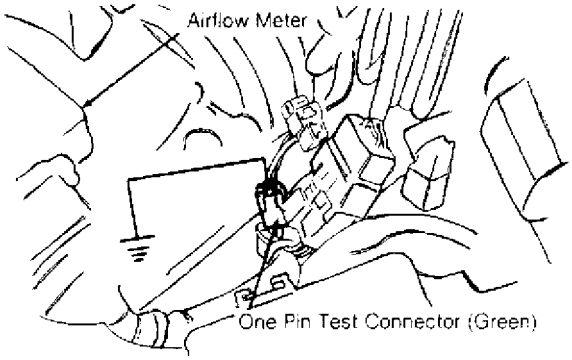


Fig. 5: Locating Green Test Connector (MPV 3.0L)
Courtesy of Mazda Motors Corp.

IGNITION TIMING SPECIFICATIONS TABLE (Degrees BTDC @ RPM)

Application	Man. Trans.	(1) Auto. Trans.
B2200		
Carbureted	6 @ 825	6 @ 825
PFI (2)	6 @ 750	6 @ 770
B2600i (2)	5 @ 750	5 @ 770
Miata (3)	10 @ 850	8 @ 850
MPV		
2.6L (2)	N/A	5 @ 770
3.0L (2)	N/A	11 @ 800
MX-3		
1.6L (3)	10 @ 750	10 @ 750
1.8L (3)	10 @ 670	10 @ 670
MX-6 & 626		
2.0L (3)	12 @ 700	12 @ 700
2.5L (3)	10 @ 650	10 @ 650
Navajo	(4)	(4)
Protege		
DOHC (3)	10 @ 750	10 @ 750
SOHC (3)	5 @ 750	5 @ 750
RX7		
Leading (3)	(5) 5 @ 725	(5) 5 @ 725
Trailing (3)	(5) 20 @ 725	(5) 20 @ 725
323 (3)	7 @ 750	7 @ 750
929 (3)	N/A	12 @ 700

(1) - Place automatic transmission in Park.
(2) - Connect jumper wire between Green test connector and ground.
(3) - Connect jumper wire between terminals TEN and GRN of diagnostic connector.
(4) - Base (initial) timing is preset at 10 degrees BTDC and is not adjustable.
(5) - Timing specification is AFTER TDC and is not adjustable.

IDLE SPEED & MIXTURE

NOTE: Mixture adjustment is NOT a normal tune-up procedure. DO NOT adjust mixture unless mixture control unit is replaced or vehicle fails emissions test.

CHOKE

B2200 (Carbureted)

Apply about 16 in. Hg to choke pull-off diaphragm. Lightly push the choke plate to closed position. Measure clearance between top of choke plate and air horn. If clearance is not .067-.085" (1.70-2.16 mm), bend lever on choke plate shaft until clearance is within specification.

COLD (FAST) IDLE SPEED

NOTE: For adjustments of the choke unloader, fast idle cam (static adjustment) and secondary throttle valve, see information in N - REMOVE/INSTALL/OHAUL article.

B2200 (Carbureted)

1) Warm engine to normal operating temperature. Turn off engine. Disconnect and plug vacuum hoses to idle compensator and reed valves. Hold throttle valve slightly open. Push choke plate fully closed. Release throttle valve.

2) Remove pressure from choke plate. Start engine without touching accelerator pedal or throttle valve. If engine speed is not 3000-4000 RPM, turn fast idle screw until within specification.

COLD (FAST) IDLE SPEED

RX7

1) With engine cold, ensure roller near screw "B" is centered on fast idle cam. See Fig. 6. Warm engine to operating temperature. At 130-149øF (55-65øC), wax rod should extend fully and fast idle cam should separate from roller. If wax rod does not operate as described, replace wax rod or adjust separation point.

2) Turn screw "B" until separation point is as described in step 1). See Fig. 7. To adjust fast idle cam opening, turn screw "A". Using screw "A", align points on fast idle cam with roller at corresponding temperature. See FAST IDLE CAM OPENING SPECIFICATIONS (RX7) table.

FAST IDLE CAM OPENING SPECIFICATIONS TABLE (RX7)

Temperature øF (øC)	Position
-5 (-20)	"A"
32 (0)	"B"
77 (25)	"C"

140 (60) .... "D"
ÄÄ

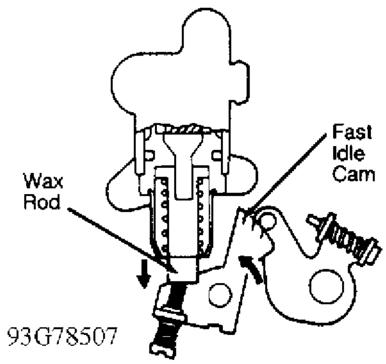


Fig. 6: Checking Fast Idle Cam Separation (RX7)
Courtesy of Mazda Motors Corp.

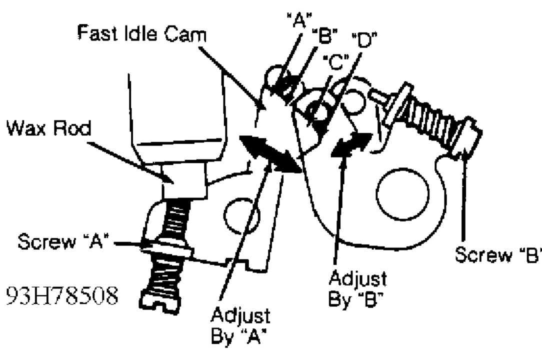


Fig. 7: Adjusting Fast Idle Cam Opening (RX7)
Courtesy of Mazda Motors Corp.

DASHPOT

NOTE: Before adjusting dashpot, warm engine to normal operating temperature. Turn off all accessories. Place transmission in Neutral (M/T) or Park (A/T).

B2200 (Carbureted M/T)

Slowly increase engine RPM until throttle lever separates from dashpot. If engine speed is not 2700-2900 RPM when throttle lever separates from dashpot, loosen lock nut and adjust dashpot as necessary. Tighten lock nut.

Miata, MPV 3.0L, MX-3 1.6L, Protege, RX7 & 323

Operate engine at 4000 RPM. Slowly decrease engine RPM until throttle lever contacts dashpot. If engine RPM is not as specified when throttle lever contacts dashpot, loosen lock nut and adjust dashpot as necessary. See DASHPOT SPECIFICATIONS table. Tighten lock

nut.

DASHPOT SPECIFICATIONS TABLE

Application	RPM
B2200 (Carbureted M/T)	2700-2900
Miata	2350-2650
MPV (3.0L)	3200-3800
MX-3 (1.6L)	About 3000
Protege	
DOHC	About 3500
SOHC	About 2700
RX7	2600-3000
323	About 3000

IDLE SPEED

NOTE: Before adjusting idle speed, warm engine to normal operating temperature. Turn off all accessories. Place transmission in Neutral (M/T) or Park (A/T). Ensure ignition timing is adjusted. See IGNITION TIMING.

B2200 (Carbureted)

Connect tachometer to negative side of ignition coil primary circuit (White wire). Ensure choke is fully open and throttle valve lever is not resting on fast idle cam. If idle speed is not 825 RPM, turn idle speed adjusting screw on carburetor until within specification.

B2200 (PFI) & B2600i

Connect jumper wire between ground and Green 1-pin test connector in right rear corner of engine compartment. See Fig. 2. Connect tachometer to negative side of ignition coil primary circuit (White wire). If idle speed is not within specification, rotate idle air adjusting screw on throttle body. See IDLE SPEED SPECIFICATIONS table. Disconnect jumper wire.

NOTE: On Miata, use Blue 1-pin connector near airflow meter as a source of battery power for positive lead of tachometer or timing light (battery is in trunk). DO NOT ground this connector, or 20-amp WIPER fuse will blow.

Miata, MX-3, MX-6, Protege, 323, 626 & 929

1) Connect Diagnostic Tester (49 B019 9A0) to diagnostic connector and select SELF-TEST mode, or connect jumper wire between diagnostic connector terminals TEN and GND. See Fig. 3. Connect tachometer to diagnostic connector terminal IG (-).

2) If idle speed is not within specification, rotate idle air adjusting screw on throttle body. See IDLE SPEED SPECIFICATIONS table. Disconnect jumper wire.

MPV

1) Connect jumper wire between ground and Green 1-pin test connector in left front corner of engine compartment. See Fig. 4 or 5. On 2.6L, connect tachometer to White 1-pin test connector in left front corner of engine compartment. On 3.0L, connect tachometer to test connector at ignition coil (White wire).

2) On all models, if idle speed is not within specification, rotate idle air adjusting screw on throttle body. See IDLE SPEED SPECIFICATIONS table. Disconnect jumper wire.

NOTE: On Navajo, idle speed is computer controlled and is not adjustable. However, use the following initial throttle angle adjustment procedure (minimum air rate setting) as a basis for diagnosing idle speed problems or if throttle stop screw has been incorrectly set.

Navajo

1) Ensure the following conditions exist: throttle bore, throttle plate and Idle Speed Control (ISC) air by-pass valve are free of contamination, oxygen sensor is free of contamination and is operating, throttle stop lever is resting against throttle stop screw, no vacuum leaks are present, cooling system is full, and ignition timing is set to specification.

2) Perform a thorough basic inspection and Self-Test (KOEO, KOER and continuous memory) to confirm operation of sub-systems which may contribute to idle speed control problems. See appropriate information in G - TESTS W/ CODES article.

3) With engine off, disconnect negative battery cable for at least 5 minutes. Connect negative battery cable. Start engine and allow idle speed to stabilize for 2 minutes. Snap throttle open and return to idle. Lightly press and release accelerator. Turn engine off. Disconnect ISC air by-pass solenoid.

NOTE: If engine RPM fluctuates during idle, throttle plate may be open enough to allow canister purge flow. To verify this condition, disconnect and plug canister purge line. If purge is present, close throttle plate until fluctuations stop.

4) Start engine. Operate engine at 2500 RPM for 30 seconds. Allow engine to idle for 2 minutes. Turn throttle stop screw until engine idles at 675 RPM.

5) Turn off engine. Repeat step 4). Turn off engine. Disconnect negative battery cable for at least 5 minutes. Connect ISC air by-pass solenoid connector. Connect negative battery cable. Verify throttle plate is not stuck in bore and linkage is not preventing throttle stop lever from contacting throttle stop.

6) Start engine and allow to idle for 2 minutes. Snap throttle open and return to idle. Lightly press and release accelerator. Allow engine to idle. If engine does not idle properly, see H - TESTS W/O CODES article.

RX7

1) Connect Diagnostic Tester (49 B019 9A0) to diagnostic connector and select SELF-TEST mode (position 1), or connect jumper wire between diagnostic connector terminals TEN and GND. See Fig. 3. Connect tachometer to diagnostic connector terminal IG (-).

2) If idle speed is not within specification, rotate air adjusting screw on throttle body. See Fig. 8. See IDLE SPEED SPECIFICATIONS table. If idle speed is too high with air adjusting screw closed, turn throttle adjusting screw. Disconnect jumper wire.

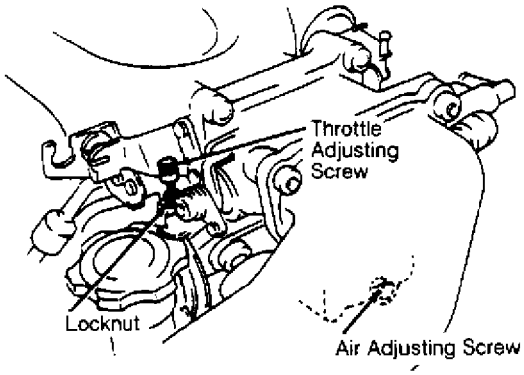


Fig. 8: Adjusting Idle Speed (RX7)
Courtesy of Mazda Motors Corp.

IDLE SPEED SPECIFICATIONS TABLE

Application	Man. Trans. RPM	(1) Auto. Trans. RPM
B2200		
Carbureted	825	825
PFI (2)	750	770
B2600i (2)	750	770
Miata (3)	850	850
MPV		
2.6L (2)	N/A	770
3.0L (2)	N/A	800
MX-3		
1.6L	750	750
1.8L	670	670
MX-6 (3)	750	750
Navajo	(4)	(4)
Protege (3)	750	750
RX7	700-750	700-750
323 (3)	750	750
626 (3)	750	750
929 (3)	N/A	700

(1) - Place automatic transmission in Park.
(2) - Connect jumper wire between Green test connector and ground.
(3) - Connect jumper wire between terminals TEN and GND of diagnostic connector.
(4) - Idle speed is not adjustable; however, throttle angle (minimum air rate) can be set using special procedure.
ÄÄ

IDLE MIXTURE

B2200 (Carbureted)

1) Check for presence of mixture screw roll pin. See Fig. 9. If roll pin has already been removed, go to next step. If roll pin is present, remove air cleaner and carburetor. Drive out mixture screw roll pin. Install carburetor.

2) Install air cleaner. Ensure idle compensator valve is closed. Warm engine to normal operating temperature. Connect dwell meter (on4-cylinder setting) between ground and mixture check connector (Brown/Yellow wire). See Fig. 10.

3) Adjust idle speed to 825 RPM. Turn mixture adjusting screw until dwell reading is 27-45 degrees. Reset idle speed (if necessary). Replace mixture roll pin after adjustment. If mixture cannot be adjusted to specification, see H - TESTS W/O CODES article.

Except B2200 (Carbureted)

Air/fuel mixture is computer controlled and cannot be manually adjusted. If CO level is excessive, see H - TESTS W/O CODES article.

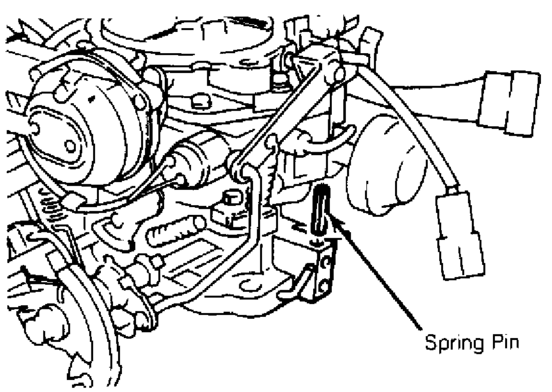


Fig. 9: Removing Carburetor Mixture Screw Roll Pin (B2200 Carbureted)
Courtesy of Mazda Motors Corp.

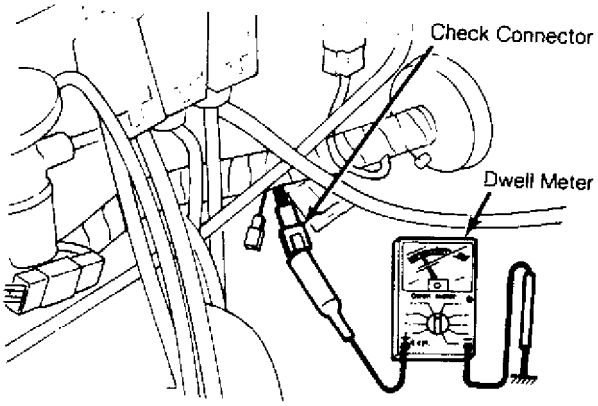


Fig. 10: Connecting Dwell Meter To Mixture Check Connector (Brown/Yellow Wire)-(B2200 Carbureted)
Courtesy of Mazda Motors Corp.

THROTTLE POSITION (TP) SENSOR

B2200 (CARBURETED)

See B2200 (CARBURETED) under THROTTLE (IDLE) SWITCH.

B2200 PFI, B2600i & MPV 2.6L

Inspection & Adjustment

1) Warm engine to normal operating temperature. Remove throttle body air inlet hose. Disconnect TP sensor connector. Install Test Harness (49 G018 901) between TP sensor and harness.

2) Turn ignition on. Ensure throttle valve is fully closed. Using a voltmeter capable of measuring voltage variations of .01 volt, measure voltage at Red and Black wires of test harness. See Fig. 11.

3) If voltage is 4.5-5.5 volts at Red wire and about zero volts at Black wire, go to next step. If voltage values are not as specified, check battery voltage and wiring harness between Electronic Control Unit (ECU) and TP sensor. If battery voltage and harness are okay, replace ECU.

4) Record voltage at Red wire. Measure voltage at Blue wire of test harness while varying throttle from closed to wide open position. Ensure voltage is within specification and voltmeter indicates a smooth voltage transition as throttle goes from closed to wide open position. See TP SENSOR VOLTAGE (B2200 PFI, B2600i & MPV 2. 6L) table.

5) If voltage is not as specified, loosen TP sensor screw. Rotate TP sensor until Blue wire voltage is as specified. Tighten TP sensor screw. If TP sensor cannot be adjusted to specification, replace TP sensor. Disconnect negative battery cable and apply brake pedal for 5 seconds to erase ECU memory.

6) If voltage is as specified, turn ignition off. Disconnect test harness. Reconnect TP sensor connector. Disconnect negative battery cable and apply brake pedal for 5 seconds to erase ECU memory.

TP SENSOR VOLTAGE (B2200 PFI, B2600i & MPV 2.6L)

Red Wire Voltage	Blue Wire Voltage Closed Throttle	Blue Wire Voltage Wide Open Throttle
4.50-4.59	.37-.54	3.58-4.23
4.60-4.69	.38-.55	3.66-4.32
4.70-4.79	.39-.56	3.74-4.41
4.80-4.89	.40-.57	3.82-4.51
4.90-4.99	.40-.58	3.90-4.60
5.00-5.09	.41-.60	3.97-4.70
5.10-5.19	.42-.61	4.05-4.79
5.20-5.29	.43-.62	4.13-4.88
5.30-5.39	.44-.63	4.21-4.98
5.40-5.49	.44-.64	4.29-5.07
5.50	.44-.66	4.29-5.17

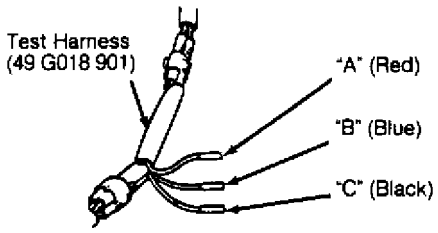


Fig. 11: TP Sensor Test Harness Terminal ID (B2200 PFI, B2600i & MPV 2.6L)
Courtesy of Mazda Motors Corp.

MIATA A/T, MX-3 1.6L A/T & 1.8L,
PROTEGE A/T, 323 A/T, MX-6 2.5L & 626 2.5L

Inspection

1) Disconnect TP sensor connector. Connect ohmmeter between TP sensor connector terminals "E" and IDL. See Fig. 12. Insert feeler gauge of specified thickness between throttle lever and throttle stop screw. See TP SENSOR CONTINUITY (MIATA A/T, MX-3 1.6L A/T & 1.8L, PROTEGE A/T, 323 A/T, MX-6 2.5L & 626 2.5L) table.

2) If continuity is not as specified, adjust TP sensor. See ADJUSTMENT procedure. If continuity is as specified, connect ohmmeter between TP sensor connector terminals Vt and "E". If resistance is less than 1000 ohms with throttle fully closed and about 5000 ohms with throttle wide open, TP sensor is adjusted. If resistance is not as specified, adjust TP sensor. See ADJUSTMENT procedure.

NOTE: If ohmmeter reading indicates a rough transition anywhere in range between lowest and highest readings, TP sensor potentiometer is faulty. Replace TP sensor.

Adjustment

1) Disconnect TP sensor connector. Connect ohmmeter between TP sensor connector terminals "E" and IDL. See Fig. 12. Loosen TP sensor attaching screws.

2) Insert a .006" (.15 mm) feeler gauge (MX-3 1.8L, MX-6 2.5L and 626 2.5L) or .010" (.25 mm) feeler gauge (all other models) between throttle lever and throttle stop screw. Rotate TP sensor clockwise about 30 degrees, then rotate counterclockwise until ohmmeter indicates continuity.

3) Remove feeler gauge. Insert a .020" (.50 mm) feeler gauge (MX-3 1.8L, MX-6 2.5L and 626 2.5L) or .016" (.40 mm) feeler gauge (all other models) between throttle lever and throttle stop screw. If ohmmeter indicates no continuity, go to next step. If ohmmeter indicates continuity, repeat adjustment procedure.

4) Tighten TP sensor attaching screws. Open throttle valve fully and verify resistance between terminals "E" and Vt is about 5000 ohms.

NOTE: TP sensor on MX-6 2.0L and 626 2.0L is not adjustable.

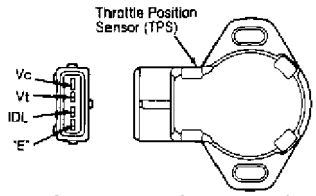


Fig. 12: TP Sensor Connector Terminal ID (Miata A/T, MX-3 1.6L A/T & 1.8L, Protege A/T, 323 A/T, MX-6 2.5L & 626 2.5L) Courtesy of Mazda Motors Corp.

TP SENSOR CONTINUITY (MIATA A/T, MX-3 - 1.6L A/T & 1.8L, PROTEGE A/T, 323 A/T, MX-6 2.5L & 626 2.5L)

Test Condition (1)	(2) Continuity
MX-3 1.8L, MX-6 2.5L & 626 2.5L	
.006" (.15 mm)	Yes
.020" (.50 mm)	No
All Others	
.004" (.10 mm)	Yes
.024" (.60 mm)	No

(1) - Insert feeler gauge of specified thickness between throttle lever and throttle stop screw.
(2) - Check continuity with ohmmeter connected between TP sensor terminals "E" and IDL.

MIATA, MX-3 1.6L, PROTEGE & 323 - M/T

Inspection

1) Disconnect TP sensor connector. Insert feeler gauge of specified thickness between throttle lever and throttle stop screw.

See TP SENSOR CONTINUITY (MIATA, MX-3 1.6L, PROTEGE & 323 - M/T) table.

2) Connect ohmmeter between specified terminals of TP sensor connector. See Fig. 13. If continuity is not as specified, adjust TP sensor. See ADJUSTMENT procedure.

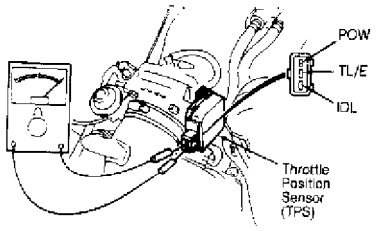
Adjustment

1) Disconnect TP sensor connector. Connect ohmmeter between terminals IDL and TL/E of TP sensor connector. See Fig. 13. Insert a .016" (.41 mm) feeler gauge between throttle lever and throttle stop screw.

2) Loosen TP sensor screws. Rotate TP sensor clockwise about 30 degrees, then rotate counterclockwise until ohmmeter indicates continuity.

3) Remove feeler gauge. Insert a .027" (.69 mm) feeler gauge between throttle lever and throttle stop screw. If ohmmeter indicates no continuity, go to next step. If ohmmeter indicates continuity, repeat adjustment procedure.

4) Tighten TP sensor attaching screws. Open throttle valve fully a few times. Recheck TP sensor adjustment.



92I24933

Fig. 13: TP Sensor Connector Terminal ID (Miata, MX-3 1.6L, Protege & 323 - M/T)
Courtesy of Mazda Motors Corp.

TP SENSOR CONTINUITY (MIATA, MX-3 1.6L, PROTEGE & 323 - M/T) TABLE

Test Condition	Continuity Between IDL & TL/E	Continuity Between POW & TL/E
Miata		
.016" (.41 mm) (1)	Yes	No
.027" (.7 mm) (1)	No	No
WOT	No	Yes
MX-3 1.6L, Protege & 323		
.004" (.10 mm) (1)	Yes	No
.039" (1.0 mm) (1)	No	No
WOT	No	Yes

(1) - Insert feeler gauge of specified thickness between throttle lever and throttle stop screw.

MPV 3.0L & 929

Inspection

Disconnect TP sensor connector. Using an ohmmeter, measure resistance between specified terminals of TP sensor connector. See TP SENSOR RESISTANCE (MPV 3.0L & 929) table. See Fig. 14 or 15. If resistance is not as specified, adjust TP sensor. See ADJUSTMENT procedure.

Adjustment

1) Insert a feeler gauge of specified thickness between throttle lever and throttle stop screw. See TP SENSOR ADJUSTMENT (MPV 3.0L & 929) table. Check continuity between TP sensor connector terminals "C" and "D". See Fig. 14 or 15.

2) If continuity is not as specified, loosen TP sensor mounting screws. Rotate TP sensor until continuity is as specified. Tighten mounting screws. Connect TP sensor connector.

TP SENSOR RESISTANCE (MPV 3.0L & 929) TABLE

Application	Ohms
MPV 3.0L	
Between Terminals "A" & "D"	3000-6000
Between Terminals "B" & "D"	
Closed Throttle	About 1000 Or Less
Wide Open Throttle	3000-6000
929	
Between Terminals "A" & "D"	3000-6000
Between Terminals "B" & "D"	
Closed Throttle	200-600
Wide Open Throttle	3300-7000

TP SENSOR ADJUSTMENT TABLE (MPV 3.0L & 929)

Test Condition (1)	Continuity Between Terminals "C" & "D"
MPV 3.0L	
.020" (.5 mm)	Yes
.028" (.7 mm)	No
929	
.004" (.1 mm)	Yes
.008" (.2 mm)	No

(1) - Insert feeler gauge of specified thickness between throttle lever and throttle stop screw.

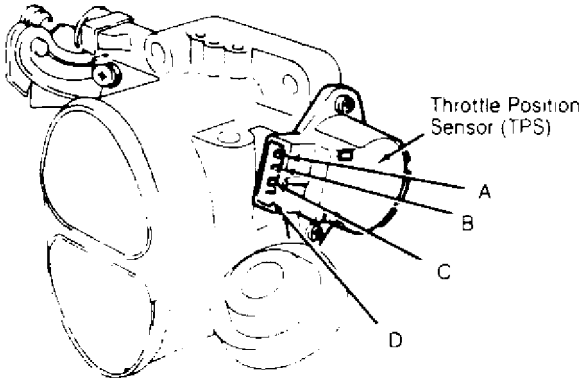


Fig. 14: Identifying TP Sensor Terminals (MPV 3.0L)
Courtesy of Mazda Motors Corp.

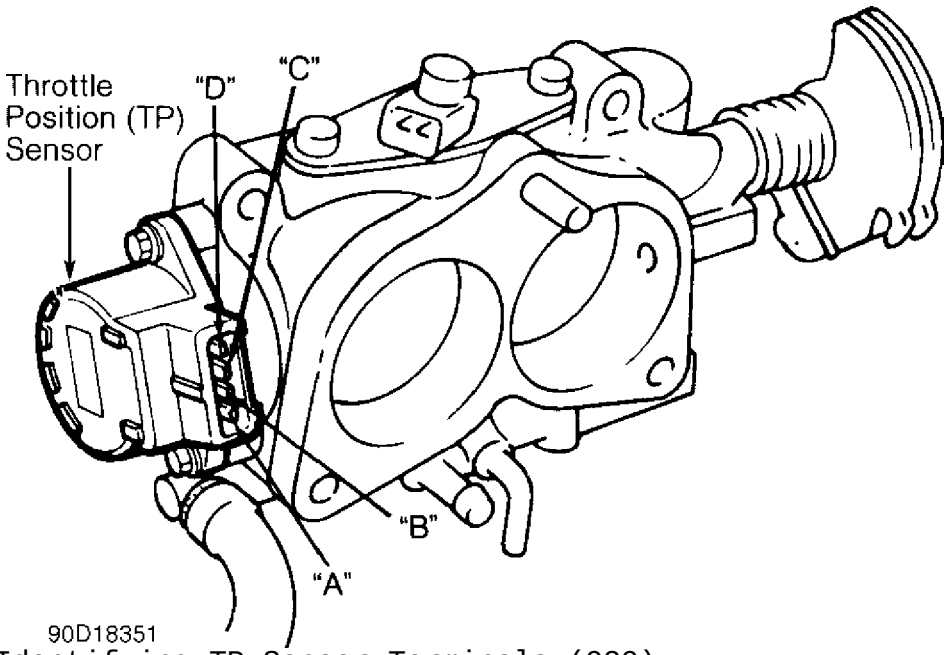


Fig. 15: Identifying TP Sensor Terminals (929)
Courtesy of Mazda Motors Corp.

NAVAJO

NOTE: TP sensor is not adjustable. Replace TP sensor if voltage readings are not within specification.

1) Ensure throttle linkage is not preventing throttle stop lever from contacting throttle stop screw. Disconnect Electronic Control Assembly (ECA) 60-pin connector. Inspect connector for damaged pins, corrosion or loose wires and repair as necessary.

2) Connect Breakout Box (T83L-50-EEC-IV) between ECA and ECA harness. Connect digital voltmeter positive lead to pin No. 47 and negative lead to pin No. 46 of breakout box.

3) Turn ignition on. Observe voltmeter while slowly moving throttle between fully closed and wide open positions. Voltage should

be .60 volt with throttle fully closed and about 4.50 volts throttle fully open.

4) If voltages values are not as specified, ensure throttle angle (minimum air rate) is correct. See IDLE SPEED under IDLE SPEED & MIXTURE. If throttle angle is correct, remove TP sensor.

5) Check for damaged, corroded or misadjusted pins. If pins are okay, install TP sensor. Check voltage readings again. If voltage readings are not as specified, perform KOEO self-test. See information G - TEST W/ CODES article. If KOEO self-test indicates no problems, replace TP sensor.

RX7

Inspection & Adjustment

1) Turn ignition off. Connect Harness Adapter (49 F018 902) and Signal Monitor (49 9200 162) to vehicle. See Fig. 16. Turn ignition on. Manually rotate throttle lever, and check TP sensor signal. See TP SENSOR VOLTAGE (RX7) table.

2) If voltage is not within specification, close throttle. Loosen TP sensor screws, and rotate TP sensor. See Fig. 17. Recheck TP sensor signal. Turn ignition off. Disconnect test equipment. Disconnect negative battery cable and depress brake pedal for 20 seconds. Reconnect negative battery cable.

TP SENSOR VOLTAGE TABLE (RX7)

Wire Color To Ground	Closed Throttle Volts	Wide Open Throttle Volts
Green/Red (3F) (1)	.75-1.25	4.8-5.0
Black/Green (3G) (1)	0.7-1.0	4.2-4.6

(1) - PCM terminal pin No. in parentheses.

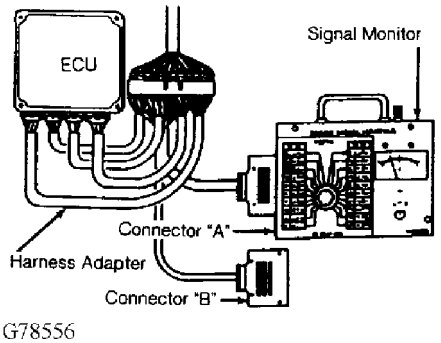


Fig. 16: Checking TP Sensor Voltage Signal (RX7)
Courtesy of Mazda Motors Corp.

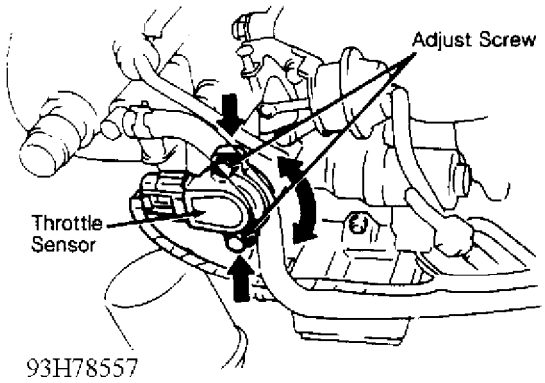


Fig. 17: Adjusting TP Sensor (RX7)
Courtesy of Mazda Motors Corp.

THROTTLE (IDLE) SWITCH

B2200 (CARBURETED)

1) Warm engine to operating temperature. Connect tachometer. Operate engine at idle. Using voltmeter, backprobe Light Green/Red wire terminal of idle switch connector. See Fig. 18.
2) Increase engine speed to more than 2000 RPM. Gradually decrease engine speed. If voltage is not as specified in THROTTLE SWITCH VOLTAGE TEST (B2200 CARBURETED) table, turn idle switch adjusting screw until voltage is within specification.

THROTTLE SWITCH VOLTAGE TEST TABLE (B2200 CARBURETED)

RPM	Volts
825 (Idle)	About 12
1000-1250	Less Than 1.5

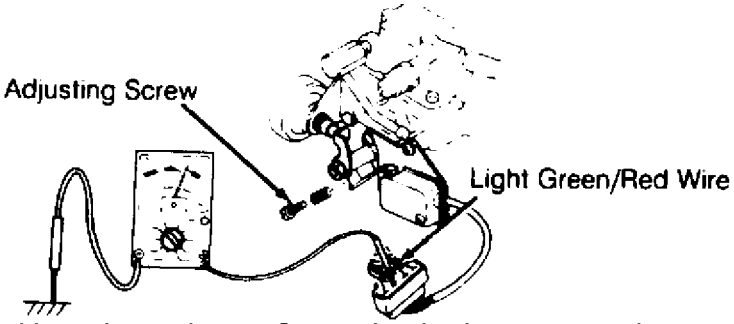


Fig. 18: Adjusting Throttle Switch (B2200 Carbureted)
Courtesy of Mazda Motors Corp.

EXCEPT B2200 (CARBURETED)

Throttle switch is either a part of TP sensor, which is adjusted automatically when TP is adjusted, or a separate, nonadjustable switch on throttle body. See THROTTLE POSITION (TP) SENSOR.

END OF ARTICLE

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda Theory & Operation - Rotary Engine

RX7

INTRODUCTION

This article covers basic description and operation of engine performance-related systems and components. Read this article before diagnosing vehicles or systems with which you are not completely familiar.

AIR INDUCTION SYSTEM

4-Port Induction

The 4-port induction uses primary or primary and secondary intake manifold paths, located in intake system. During low speed light load, intake air enters engine through one lower throttle valve. Under high RPM and heavy load, throttle cable also opens 2 upper throttle valves. These feed intake air to the outside passages in intake manifold. If the engine RPM is too low or engine is cold, a double throttle control valve (inside intake manifold) delays opening the outside (secondary) passages. The double throttle control valve is controlled by a solenoid and PCM.

Intercooler

Air compressed by turbochargers enters intercooler located behind radiator under cover. From intercooler, air enters throttle body housing.

Turbochargers

All models use sequential twin liquid-cooled (coolant) turbochargers. Turbochargers consists of a turbine/compressor assembly, oil supply system and wastegate. PCM-controlled solenoids are used to open or close secondary turbocharger.

The safety valve of this system is a wastegate that prevents excess intake boost pressure. Wastegate operation is controlled by turbo boost pressure control solenoid. This solenoid limits boost pressure to 10-14 psi (.7-1.0 kg/cm**ý**).

COMPUTERIZED ENGINE CONTROLS

The computerized engine control system monitors various engine and vehicle functions to control engine operation and lower emissions while maintaining fuel economy and driveability.

CONTROL UNIT

The Powertrain Control Module (PCM) monitors engine

conditions through various input sensors, and controls engine operation through the use of output signals to control various systems such as fuel, air injection, ignition, EGR and turbo control, and knock control systems. Turbo operation is controlled by the turbo pre-control, turbo control, wastegate control, charge control and charge relief solenoid valves which are all controlled by PCM.

NOTE: Components are grouped into 2 categories. The first category covers INPUT DEVICES, which control or produce voltage signals monitored by the PCM. The second category covers OUTPUT SIGNALS, which are components controlled by the PCM.

INPUT DEVICES

Vehicles are equipped with different combinations of input devices. Not all devices are used on all models. To determine the input usage on a specific model, see appropriate wiring diagram in L - WIRING DIAGRAMS article. The available input signals include the following:

A/C Switch
Switch detects A/C operation and sends signal to PCM.

Barometric Pressure (BARO) Sensor
Sensor monitors intake manifold pressure and sends signal to PCM.

Battery Power Circuit
Battery power circuit provides current to PCM. The PCM uses this circuit to monitor battery voltage.

Clutch Switch
Clutch switch detects clutch operation and sends signal to PCM. Clutch switch is closed when pedal is depressed.

Coolant Thermosensor
Sensor monitors engine coolant temperature and sends signal to PCM.

Crank Angle Sensors
These sensors, mounted to front of engine, monitor position of front crank pulley and send signals to PCM.

EGR Switch (California)
Switch detects position of EGR valve and sends signal to PCM.

Fuel Thermosensor
Sensor monitors fuel temperature in fuel rail and sends signal to PCM.

Heat Hazard Sensor
Sensor detects floor temperature near catalytic converter and

sends signal to PCM.

Inhibitor Switch (A/T)
Switch detects position of gear selector lever and sends signal to PCM.

Intake Air Thermosensor
Sensor monitors intake manifold air temperature and sends signal to PCM.

Knock Sensor
Sensor monitors engine knock conditions and sends signal to engine knock control unit.

Mileage Sensor
Sensor determines vehicle mileage and sends signal to PCM.

Neutral Switch
Switch detects gearshift Neutral position and sends signal to PCM.

Oil Metering Pump
Oil metering pump includes a position sensor which senses oil metering pump position and send signal to PCM.

Overdrive Switch (A/T)
Switch detects overdrive operation and sends signal to PCM.

Oxygen (O2) Sensor
O2 sensor monitors oxygen content of exhaust gases and sends signal to PCM.

Power Steering Pressure (PSP) Switch
PSP switch determines when pressure is required to turn the wheels and sends signal to PCM. On turbo models, a power steering relay is used along with the power steering switch.

Throttle Sensor
Sensor monitors throttle opening angle. Sensor detects both narrow range and full range of throttle opening and sends signal to PCM.

5th Gear Switch (M/T)
Switch detects engagement of 5th gear and sends signal to PCM.

Vehicle Speed Sensor
Sensor determines speed of vehicle and sends signal to PCM.

OUTPUT SIGNALS

NOTE: Vehicles are equipped with different combinations of

computer-controlled components. Not all components listed below are used on every vehicle. For theory and operation on each output component, refer to system indicated after component.

The PCM processes information from the input sensors and sends appropriate voltage control signals to the following engine controls:

By-Pass Air Control (BAC) Valve Solenoid
See IDLE SPEED under FUEL SYSTEM.

Malfunction Indicator Light
See SELF-DIAGNOSTIC SYSTEM.

Ignitor Module
See IGNITION SYSTEM.

Fuel Injectors
See FUEL CONTROL under FUEL SYSTEM.

EGR Control Solenoid
See EMISSION SYSTEMS.

Secondary Air Injection System Solenoids
See EMISSION SYSTEMS.

Turbocharger Control
See AIR INDUCTION SYSTEM.

Double Throttle Control Solenoid
See AIR INDUCTION SYSTEM.

FUEL SYSTEM

FUEL DELIVERY

Fuel Pump
Fuel under pressure from electric fuel pump flows through a fuel damper, fuel filter, injector fuel rail (delivery pipe) and fuel pressure regulator. Fuel pump is located in fuel tank. Electrical power for fuel pump operation during cranking mode is provided from starter relay via circuit opening relay, fuel pump resistor (or fuel pump relay) and PCM.

Fuel Pump Relays
The PCM turns on circuit opening relay or fuel pump relay based on inputs from ignition switch and other engine sensors. Under normal operation, PCM closes circuit opening relay. This causes fuel pump feed current to go through a fuel pump resistor, reducing electrical current to fuel pump.
During cranking, high RPM and high load, or fuel pressure

regulator control operation, PCM supplies current to energize fuel pump relay. This causes fuel pump feed current to by-pass fuel pump resistor, providing maximum current to fuel pump.

Fuel Pressure Regulator

The pressure regulator is a sealed unit which is divided into 2 chambers (fuel and spring chambers) by a diaphragm. The fuel chamber receives fuel through the inlet side from the injector fuel rail. The spring chamber is connected to intake manifold vacuum.

At idle, intake manifold vacuum is high. The diaphragm is pulled back by intake manifold vacuum. Any excessive fuel is returned to the fuel tank. As throttle is depressed, intake manifold vacuum decreases. The regulator spring overcomes manifold vacuum, increasing fuel pressure.

During hot restarts, PCM increases fuel pressure at injectors by sending a signal to fuel pressure regulator control solenoid valve.

FUEL CONTROL

Electronic Gasoline Injection (EGI) System

The EGI system is a BARO controlled, dual-injector, feedback system. An O2 sensor monitors CO content of exhaust gases. Based on O2 sensor and other signals, PCM adjusts injector's injection time accordingly. The system precisely meters amount of fuel injected into each chamber.

Fuel Injectors

PCM uses input information supplied by various sensors to determine duration of injector's injection time. Primary injectors, located below upper intake manifold, operate all the time. Secondary injectors, located in outside intake manifold runners, operate during high RPM and heavy loads.

IDLE SPEED

Idle Control Valves

The By-Pass Air Control (BAC) valve contains an air valve. Engine coolant is directed around air valve warming thermowax. When engine coolant temperature is less than 122øF (50øC), wax is contracted and engine idles fast. When coolant temperature is more than 122øF (50øC), wax is fully expanded, closing valve.

The Idle Speed Control (ISC) valve controls air by-pass amount during warm engine operation. The ISC valve compensates for all engine loads during warm engine operation to maintain a preset idle RPM. The ISC is controlled by the PCM.

The Accelerated Warm-Up System (AWS) valve is open at temperature less than 104øF (40øC). At temperature greater than 104øF (40øC), valve is closed, preventing rough idle under some cold engine conditions.

IGNITION SYSTEM

ELECTRONIC IGNITION SYSTEM

Coils & Ignitor

The RX7 uses a distributorless ignition system that uses 2 crank angle sensors, 3 coils and an ignitor assembly. The coils, one leading and 2 trailing, provide high voltage for spark operation. Crank angle sensors detect crank pulley position and send signals to PCM. The ignitor fires one coil for both leading spark plugs and fires 2 other coils for each trailing spark plug.

Mazda rotary engines use an ignition system with 2 spark plugs in each rotor housing. These fire at different times during ignition cycle. First spark plugs to fire are the leading set, and second spark plugs are the trailing set. Leading set spark plugs fire at about 5 degrees ATDC, depending on ignition advance, to begin combustion. Trailing set spark plugs fire about 20 degrees later to complete combustion.

IGNITION TIMING CONTROL SYSTEM

Ignition Timing Advance Control

All models use an Electronic Spark Advance (ESA) control system. The PCM determines ignition timing based on signals from various sensors and switches.

Detonation (Knock) Retard Operation

Knock sensor detects detonation in engine and sends signal to PCM. PCM retards ignition timing based on frequency of knocking.

EMISSION SYSTEMS

DECELERATION CONTROL SYSTEM

Deceleration system is designed to maintain a balanced air/fuel mixture during deceleration and help prevent backfiring. System consists of a fuel-cut operation (non-turbo), throttle sensor, anti-afterburn valve, dashpot and air by-pass valve (turbo).

EXHAUST GAS RECIRCULATION (EGR)

EGR system allows measured amounts of exhaust gas into intake manifold to reduce oxides of nitrogen (NOx). The EGR system consists of EGR control valve, EGR solenoid valve, EGR position switch (California), connecting hoses and pipes.

FUEL EVAPORATION SYSTEM

Fuel evaporation system prevents escape of raw fuel vapor to atmosphere. System components include fuel tank with integral vapor separator, check cut valve, purge control solenoid valve, charcoal canister, fuel filler cap, check valves and connecting lines.

PURGE CONTROL SOLENOID VALVE

This normally closed solenoid valve controls fuel vapor flow from canister to intake manifold. Valve opens and closes based on signal from PCM during various engine operating modes.

VAPOR VENT SYSTEM

All vapor valves are mounted on fuel tank and use a small orifice, which allows vapor (but not liquid) fuel to pass into line running to canister. Fuel vapors in fuel tank are vented though vapor valve assembly on top of fuel tank. Vapors are routed through a vapor line to carbon canister in engine compartment.

SECONDARY AIR INJECTION CONTROL SYSTEM

System consists of air pump (with magnetic clutch), 2 check valves, air control valve, switching solenoid valve, relief solenoid valve, split air solenoid valve and port air solenoid. Air injection system supplies air into exhaust system to help control exhaust emissions.

SELF DIAGNOSTIC SYSTEM

The PCM is equipped with a self-diagnostic system which detects system failures or abnormalities. When malfunction occurs, Malfunction Indicator Light (MIL) on instrument panel is turned on.

By analyzing various input signals, PCM detects system malfunctions related to various operating parameter sensors. PCM stores trouble codes associated with detected failure until diagnostic system is cleared.

MALFUNCTION INDICATOR LIGHT (MIL)

MIL comes on when ignition is turned on. Light remains on for several seconds after engine has started. If an abnormal input signal occurs, light comes on and code is stored in memory. If an abnormal input signal returns to normal, PCM turns light off, but code remains stored in memory until cleared. If ignition is turned on again, light will not come on until PCM detects malfunction during system operation.

NOTE: PCM diagnostic memory is retained by direct power supply from battery. Memory is not erased by turning off ignition, but is erased if battery or PCM is disconnected.

MISCELLANEOUS CONTROLS

NOTE: Although not considered true engine performance-related systems, some controlled devices may affect driveability if they malfunction.

A/C CLUTCH

When PCM detects a signal from the air conditioner PCM indicating that the A/C switch is turned on, PCM will output a signal to the magnetic clutch relay to turn it on.

The magnetic clutch operation is delayed for about 0.5 second. During this time, the PCM opens the ISC valve to offset the drop in engine RPM due to the operation of the A/C compressor.

This system also helps maintain driveability by switching off magnetic compressor clutch when vehicle is accelerated suddenly, or when engine is running under a heavy load condition.

RADIATOR FAN CONTROL

PCM detects coolant temperature and turns on one or both radiator fans. This system helps prevent rough idle.

END OF ARTICLE

F - BASIC TESTING
Article Text
1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 06:38AM

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda Basic Diagnostic Procedures

B2200, B2600i, Miata, MPV, MX-3, MX-6,
Navajo, Protege, RX7, 323, 626, 929

INTRODUCTION

The following diagnostic steps will help prevent overlooking a simple problem. This is also where to begin diagnosis for a no-start condition.

The first step in diagnosing any driveability problem is verifying the customer's complaint with a test drive under the conditions the problem reportedly occurred.

Before entering self-diagnostics, perform a careful and complete visual inspection. Most engine control problems result from mechanical breakdowns, poor electrical connections or damaged/misrouted vacuum hoses. Before condemning the computerized system, perform each test listed in this article.

NOTE: Perform all voltage tests with a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless stated otherwise in test procedure.

PRELIMINARY INSPECTION & ADJUSTMENTS

VISUAL INSPECTION

Visually inspect all electrical wiring, looking for chafed, stretched, cut or pinched wiring. Ensure electrical connectors fit tightly and are not corroded. Ensure vacuum hoses are properly routed and are not pinched or cut. See VACUUM DIAGRAMS article to verify routing and connections (if necessary). Inspect air induction system for possible vacuum leaks.

MECHANICAL INSPECTION

Compression

Check engine mechanical condition with a compression gauge, vacuum gauge, or an engine analyzer. See engine analyzer manual for specific instructions.

WARNING: DO NOT use ignition switch during compression tests on fuel injected vehicles. Use a remote starter to crank engine. Fuel injectors on many models are triggered by ignition switch during cranking mode, which can create a fire hazard or contaminate the engine's oiling system.

COMPRESSION SPECIFICATIONS TABLE

Application	Minimum psi (kg/cm2) @ RPM	Standard psi (kg/cm2) @ RPM
B2200	121 (8.5) @ 300	173 (12.2) @ 300
B2600i	142 (10.0) @ 280	185 (13.0) @ 280
Miata & 323 (1)	135 (9.5) @ 300	192 (13.5) @ 300
MPV		
2.6L	142 (10.0) @ 280	185 (13.0) @ 280
3.0L	121 (8.5) @ 300	164 (11.5) @ 300
MX-3		
1.6L	142 (10.0) @ 300	185 (13.0) @ 300
1.8L	142 (10.0) @ 300	192 (13.5) @ 300
MX-6 & 626		
2.0L	119 (8.4) @ 300	171 (12.0) @ 300
2.5L	142 (10.0) @ 250	203 (14.3) @ 250
Navajo	(2) 100 (7.0)	(2) 100 (7.0)
Protege		
SOHC (1)	121 (8.5) @ 300	173 (12.2) @ 300
DOHC (1)	128 (9.0) @ 300	182 (12.8) @ 300
RX7	79 (5.5) @ 250	100 (7.0) @ 250
929	157 (11.0) @ 270	213 (15.0) @ 270

(1) - Difference between cylinders should not be more than 28 psi (2.0 kg/cm2).
(2) - Lowest compression reading should not be less than 75 percent of highest compression reading.

Exhaust System Backpressure

The exhaust system can be checked with a vacuum or pressure gauge. Remove O2 sensor or air injection check valve (if equipped). Connect a 0-5 psi pressure gauge and run engine at 2500 RPM. If exhaust system backpressure is greater than 1 3/4 - 2 psi (.12-.14 kg/cm2), exhaust system or catalytic converter is plugged.

If a vacuum gauge is used, connect vacuum gauge hose to intake manifold vacuum port and start engine. Observe vacuum gauge. Open throttle part way and hold steady. If vacuum gauge reading slowly drops after stabilizing, exhaust system should be checked for a restriction.

FUEL SYSTEM

FUEL PRESSURE (CARBURETED)

Basic diagnosis of fuel system should begin with determining fuel system pressure.

NOTE: Fuel pump control unit terminal identification is not available from manufacturer.

Fuel Pump (Electrical)

1) Turn ignition on. Locate fuel control unit under left side of dash. Using a jumper wire, connect terminals "B" to "D". Fuel pump (located in tank) should operate. If pump does not operate, check and replace fuel pump (if necessary). Check fuel pump pressure. See FUEL PUMP PERFORMANCE (CARBURETED) table.

FUEL PUMP PERFORMANCE TABLE (CARBURETED)

Application	Pressure psi (kg/cm2)	Min. Vol. In 30 Sec. Pts. (L)
B2200		
Electrical Pump	2.8-3.6 (.20-.25)	1.1 (.53)
Mechanical Pump	3.7-4.7 (.26-.33)	.9 (.43)

2) If fuel pump operates, remove jumper wire. With ignition on, backprobe rear of fuel pump control unit. There should be 12 volts on terminals "A" and "D" only. If voltage is not as specified, check ignition and power feed.

3) Allow engine to idle. There should be 12 volts on terminals "A", "B", "D" and "F" only. If voltage is missing on terminal "B" only, replace fuel pump control unit. If voltage at any other terminal is not as specified, check ignition coil (tachometer signal) and power feed.

Fuel Pump (Mechanical)

Test pump for pressure and volume. Replace as necessary. See FUEL PUMP PERFORMANCE (CARBURETED) table.

FUEL PRESSURE (FUEL INJECTION)

WARNING: ALWAYS relieve fuel pressure before disconnecting any fuel injection related component. DO NOT allow fuel to contact engine or electrical components.

Fuel Pressure

1) Disconnect circuit opening relay. See CIRCUIT OPENING RELAY LOCATIONS table.

2) To bleed down fuel in system, start engine (if possible) and allow to die. Connect pressure gauge to fuel line at fuel filter. Reconnect circuit opening relay.

3) On Navajo, install EFI Pressure Gauge (T80L-9974-B) to relief valve. Relief valve is located on fuel supply manifold.

4) Turn ignition on. On Miata, MX-3, MX-6, Protege, RX7, 323, 626 and 929, jump test connector terminals Fp and ground. On all other models, use a jumper wire and connect terminals of Yellow fuel pump check connector together. See FUEL PUMP CHECK CONNECTOR (YELLOW) LOCATION table. On all models, if pump does not run, check fuel pump circuit and circuit opening relay.

FUEL PUMP CHECK CONNECTOR (YELLOW) LOCATION TABLE

Application	Location
B2200 (PFI) & B2600i	On Firewall, Near Windshield Wiper Motor
MPV	Near Airflow Sensor
Navajo	At Right Inner Fender Panel

5) If possible, start engine. Check fuel pressure with vacuum connected to and disconnected from pressure regulator. See REGULATED FUEL PRESSURE (FUEL INJECTION) table. Turn engine off and disconnect jumper wire at fuel pump check connector. Wait 10 minutes and ensure residual pressure is at least 21 psi (1.5 kg/cm2).

6) Operate fuel pump by jumpering fuel pump test connector. Check fuel pump performance. Pinch hose between pressure gauge and fuel filter. DO NOT hold longer than necessary to check pressure. See FUEL PUMP PERFORMANCE table. If pump does not meet specifications, check fuel pump circuits, fuel pump, fuel tank, fuel filter and repair or replace as necessary.

FUEL PUMP PERFORMANCE TABLE

Application	Pressure
Navajo	(1)
MX-6 & 626 With 2.5L	72-92 psi (5.0-6.5 kg/cm2)
All Others (2)	64-92 psi (4.5-6.5 kg/cm2)

(1) - Information is not available from manufacturer.
(2) - Minimum volume in 30 seconds is 1.0 pint (.47L).

REGULATED FUEL PRESSURE (FUEL INJECTION) TABLE

Application	At Idle W/ Vacuum psi (kg/cm2)	At Idle W/O Vacuum psi (kg/cm2)
B2200 (PFI) & B2600i	28-37 (2.0-2.6)	38-46 (2.7-3.2)
Miata, MX-6 & 626	31-38 (2.2-2.7)	38-46 (2.7-3.2)
MPV	30-37 (2.1-2.6)	38-46 (2.7-3.2)
MX-3, Protege & 323	30-37 (2.1-2.6)	38-46 (2.7-3.2)
RX7	27-32 (1.9-2.3)	36-38 (2.5-2.7)
Navajo	(1)	(2)
929	31-38 (2.2-2.7)	38-46 (2.7-3.2)

(1) - Pressure should be 30-46 psi (2.1-3.2 kg/cm2) with engine running and 36-46 psi (2.5-3.2 kg/cm2) with key on and engine off.
(2) - Information is not available from manufacturer.

ÄÄÄ

NOTE: Fuel pump control unit terminal identification is not available from manufacturer.

Fuel Pump Circuit (Except Navajo)

1) Turn ignition on. On B2200 (PFI), B2600i and MPV connect terminals of Yellow fuel pump check connector with a jumper wire. See FUEL PUMP CHECK CONNECTOR (YELLOW) LOCATIONS table. On Miata, MX-3, MX-6, Protege, RX7, 323, 626 and 929, attach jumper wire to test connector terminal Fp and to ground in the diagnostic connector, next to battery.

2) Listen for fuel pump operating sound. If there is no sound, check main fuse, circuit operating relay, fuel pump and all electrical connections. On MX-3, MX-6, RX-7, 626 and 929, PCM grounds circuit opening relay and operates fuel pump whenever distributor or crank angle sensor signals are present. On other models, airflow meter grounds circuit opening relay whenever airflow is present.

3) If circuit opening relay does not work, see SYSTEM & COMPONENT TESTING article or appropriate G - TESTS W/CODES article.

Fuel Pump Circuit (Navajo)

1) If fuel pressure is zero or low, with ignition off, ensure Inertia Fuel Shut-Off (IFS) switch is set. Ensure battery is fully charged. Using a jumper lead, ground FP lead terminal of self-test connector. See Fig. 1. IFS switch is located under dash to the right of transmission tunnel. With ignition on, engine off and IFS switch electrical connector connected, check voltage at IFS switch. If voltage is 10.5 volts or more at both IFS switch terminals, go to step 3).

2) If voltage is 10.5 volts or more at only one IFS switch terminal, replace IFS switch. If voltage is less than 10.5 volts at both IFS switch terminals, check and repair wiring circuit.

3) With ignition off, ensure connection is okay at pump/sender unit. Turn ignition on, with engine off. Listen for sound of fuel pump operation. If pump is not running, go to next step. If pump is running, check condition of fuel filter. If filter is okay, replace fuel pump. If filter is dirty, replace filter and recheck system.

4) Turn ignition off and disconnect fuel pump/sender connector. See Fig. 1. Turn ignition on, with engine off. Measure voltage at pump power terminal (Pink/Black wire) of pump/sender connector. If voltage is 10.5 volts or more, go to next step. If voltage is not 10.5 volts or more, repair open in Pink/Black wire between fuel pump and inertia switch.

5) With fuel pump/sender connector still disconnected, measure resistance of pump ground wire (Black wire) to chassis ground. See Fig. 1. If resistance is less than one ohm, go to next step. If resistance is not less than one ohm, repair open in Black wire between fuel pump and ground.

6) Turn ignition off. Measure resistance between IFS switch and ground. If resistance is less than 5 ohms, replace fuel pump. For

additional circuit testing information see CIRCUIT TEST J in appropriate G - TESTS W/CODES article.

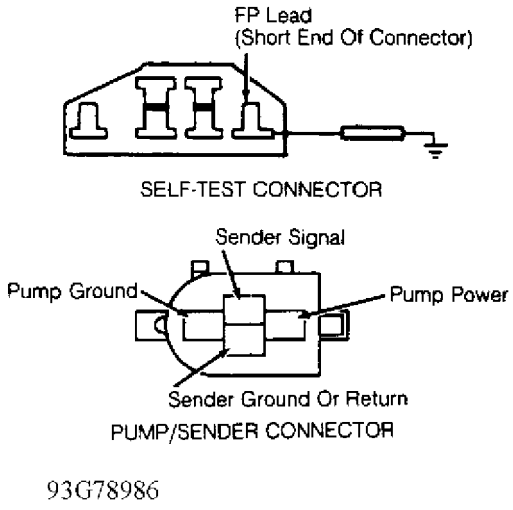


Fig. 1: Identifying Fuel Pump & Self-Test Connectors (Navajo)
Courtesy of Mazda Motors Corp.

Fuel Pump Relay (Navajo)

1) Remove fuel pump relay (located under power distribution box on right inner fender). Connect 12 volts to terminal "C" and ground terminal "D". Check for continuity between terminals "A" and "B". If continuity is present, relay is okay. If continuity is not present, replace relay.

2) Turn ignition on. Ensure 12 volts are present on Red and Black/Yellow or Yellow wires. If 12 volts are not present, repair circuits from Electronic Engine Control (EEC) power relay, battery or power distribution box.

3) Connect 12 volts to terminal "A". Fuel pump should operate. If pump does not operate, repair wiring to inertia switch, fuel pump or fuel pump ground, or replace fuel pump.

Inertia Fuel Shut-Off (IFS) Switch (Navajo)

IFS switch is located under dash to the right of transmission tunnel. To reset switch, make sure no fuel leaks are present. Push reset button.

Circuit Opening Relay (Except MX-3, MX-6, Navajo, 626 & 929)

1) With relay connected, ensure specified voltage is present at relay terminals. See CIRCUIT OPENING RELAY CIRCUIT VOLTAGE table. For location of circuit opening relays, see CIRCUIT OPENING RELAY LOCATION table.

2) If voltages are okay, remove relay from vehicle. Check relay operation using a 12-volt battery source and perform resistance tests. See Fig. 2.

Circuit Opening Relay (MX-3, MX-6, 626 & 929)

1) With relay connected, ensure battery voltage is present at relay terminal White/Red wire on MX-3, Red/Black wire on MX-6/626 2.0L or Black/White wire on MX-6/626 2.5L and 929. For locations of circuit opening relay, see CIRCUIT OPENING RELAY LOCATION table.

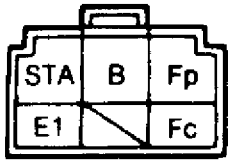
2) If voltages are okay, remove relay from vehicle. Using a 12-volt battery source, connect 12 volts to relay terminals "A" and "B". Ensure continuity is present across terminals "C" and "D". If continuity is not as specified, replace circuit opening relay.

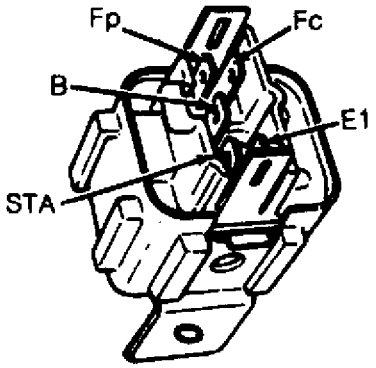
CIRCUIT OPENING RELAY LOCATION TABLE

Application	Location
B2200 (PFI) & B2600i	Behind Left Kick Panel
Miata	Under Dash, Left Of Steering Column
MPV	Mounted On PCM, Under Protective Cover On Passenger Side Floor
MX-6 & 626	In Engine Compartment Relay Box, Near Battery
MX-3, Protege & 323	Passenger Side Of Front Console, Near PCM
929	In Engine Compartment Relay Box, Near Battery

CIRCUIT OPENING RELAY CIRCUIT VOLTAGE TABLE

Terminal	Ignition ON Volts	Ignition START Volts	Idle Volts
Fp	0	12	12
Fc	12	0	0
B	12	12	12
STA	0	12	0
E1	0	0	0





12V	Grounded	Correct result
STA	E_1	B-Fp: Continuity
B	Fc	Fp: Battery voltage

RELAY VOLTAGE CHECK

Between terminals	Resistance (Ω)
STA-E_1	21—43
B-Fc	109—226
B-Fp	∞

RELAY RESISTANCE CHECK

Fig. 2: Testing Circuit Opening Relay (Except MX-3, MX-6, Navajo, 626 & 929)
Courtesy of Mazda Motors Corp.

IGNITION CHECKS (EXCEPT NAVAJO)

Spark

Check for spark at coil wire and at each spark plug wire using a high output spark tester. Check spark plug wire resistance on suspect wires. Resistance should be no less than 4878 ohms per foot.

Ignition Coil Power Source

Turn ignition on. Using voltmeter, check for 12 volts between positive (+) terminal and ground. If no voltage is present, check battery feed, main fuse, EGI main relay (RX7), ignition switch and fusible links.

Ignition Coil Resistance (Except MX-3 1.8L, MX-6 & 626)

1) Remove primary and secondary leads from ignition coil. Using ohmmeter, check primary resistance between positive and negative

terminals of coil. See Fig. 3. Resistance should be as specified in IGNITION COIL RESISTANCE table. If resistance is not as specified, replace ignition coil.

2) Check secondary resistance between (positive) terminal and coil tower. See Fig. 3. On leading coil of RX7, check secondary resistance between both high tension towers. On all models, see IGNITION COIL RESISTANCE table. If resistance is not within specification, replace coil.

Ignition Coil Resistance (MX-3 1.8L, MX-6 & 626)

1) Remove primary and secondary leads from ignition coil. Using ohmmeter, check primary resistance between terminals "A" and "C" of coil. See Fig. 4. Resistance should be as specified in IGNITION COIL RESISTANCE table. If resistance is not as specified, replace ignition coil.

2) Check secondary resistance between terminal "C" and coil tower. See Fig. 4. See IGNITION COIL RESISTANCE table. If resistance is not within specification, replace coil.

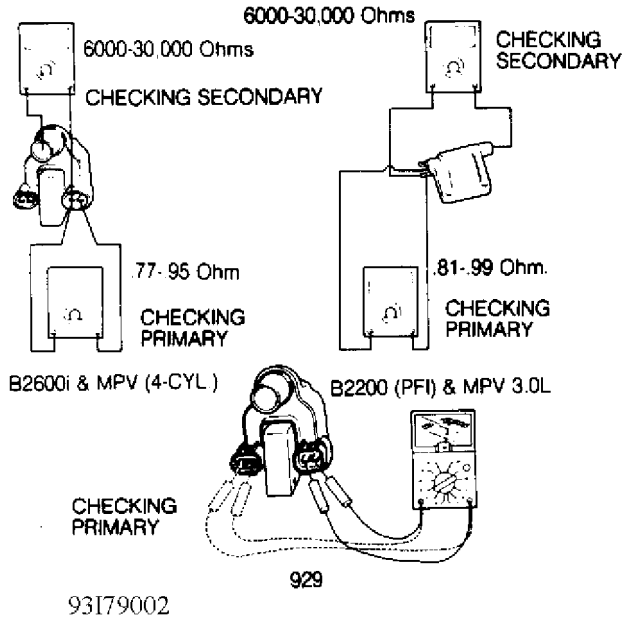


Fig. 3: Checking Coil (B2200, B2600i, MPV & 929; Others Except MX-3 1.8L, MX-6 & 626 Are Similar)
Courtesy of Mazda Motor Corp.

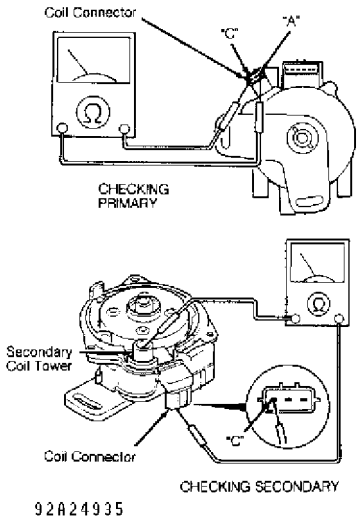


Fig. 4: Checking Coil (MX-3 1.8L, MX-6 & 626)
Courtesy of Mazda Motor Corp.

IGNITION COIL RESISTANCE TABLE - Ohms @ 68øF (20øC)

Application	Primary	Secondary
B2200		
Carbureted	1.0-1.3	6000-30,000
PFI	.81-.99	6000-30,000
B2600i	.81-.99	6000-30,000
Miata	.78-.94	11,200-15,200
MPV		
2.6L (4-Cyl.)		
Right Side	.77-.95	6000-30,000
Left Side	900-1100	(2)
3.0L (V6)	.81-.99	6000-30,000
MX-3		
1.6L (4-Cyl.)	.81-.99	10,300-16,000
1.8L (V6)	.58-.86	11,500-18,500
MX-6 & 626	.58-.86	11,500-18,500
Navajo	.5	(1)
Protege & 323	.81-.99	10,000-16,000
RX7		
Leading	0-1.0	9600-16,000
Trailing	0-1.0	Infinity
Left Side	.77-1.0	9000-17,000
Right Side	900-1100	(2)

(1) - Information is not available from manufacturer.
(2) - Not applicable.

Optical Distributor Voltage (B2200 PFI, B2600 & MPV 2.6L)

1) Turn ignition on. Check optical distributor ignition source by backprobing distributor terminal for correct voltage. See

OPTICAL DISTRIBUTOR VOLTAGE SPECIFICATIONS table.

2) Ensure ignition coil has battery voltage. If ignition coil resistance and pick-up sensor test okay, check for spark. If spark is still not present, go to appropriate IGNITOR test procedure. If spark is still not present and ignitor is okay, see appropriate SELF-DIAGNOSTICS article.

OPTICAL DISTRIBUTOR VOLTAGE SPECIFICATIONS TABLE

Wire Color	Volts
B2200 PFI & B2600	
Black/Yellow	12
Purple	(1) 0-5
Yellow/Blue	(1) 0-5
Black	0
MPV 2.6L	
Black/White	12
Purple/Black	(1) 0-5
Purple	(1) 0-5
Black/Orange	0

(1) - Voltage should fluctuate from 0-5 volts as engine is turned slowly.

Distributor Pick-Up Coil Resistance (B2200 Carb. & MPV 3.0L)

1) Disconnect pick-up coil from distributor. Using an ohmmeter, measure resistance between 2 inner terminals on pick-up coil. Replace pick-up coil if resistance is not as specified in DISTRIBUTOR PICK-UP COIL RESISTANCE table.

2) Ensure ignition coil has battery voltage. If ignition coil resistance and pick-up coil test okay, check for spark. If spark is still not present, go to appropriate IGNITOR test procedure. If spark is still not present and ignitor is okay, see appropriate information G - TESTS W/CODES article.

DISTRIBUTOR PICK-UP COIL RESISTANCE TABLE (1)

Application	Ohms
B2200 (Carb.)	900-1200
MPV (3.0L)	
Check Ignitor Terminals	
COM & Ne	205-255
COM & G1	205-255
COM & G2	205-255

Crank Angle Sensor Resistance (MX-3 1.8L, MX-6 & 626 2.5L, RX7 & 929)

1) Disconnect crank angle sensor connector. Crank angle

sensor is a separate unit located at front of crankshaft. Measure resistance between terminals. See Fig. 5. If resistance is not as indicated, replace crank angle sensor.

2) If ignition coil resistance and crank angle sensor test okay, check for spark. If spark is still not present, go to HALL-EFFECT SENSORS test procedure.

CRANK ANGLE SENSOR RESISTANCE TABLE

Application	Ohms
MX-3 1.8L (At Crankshaft Pulley)	520-580
MX-6 & 626 2.5L (At Crankshaft Pulley)	520-580
RX7 (At Crankshaft Pulley)	(1) 950-1250
929 (At Crankshaft Pulley)	950-1250

(1) - Resistance for either sensor.

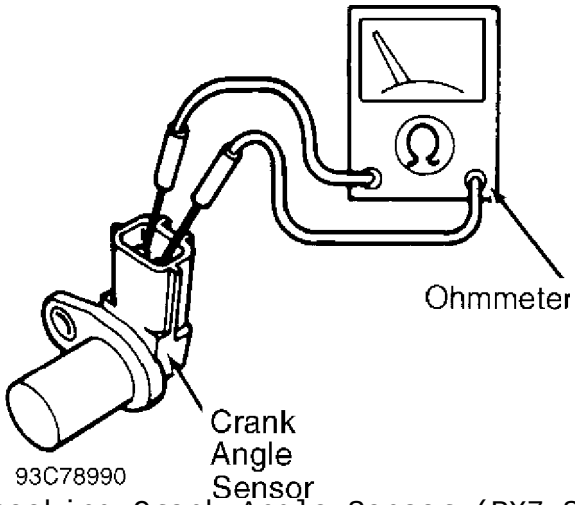


Fig. 5: Checking Crank Angle Sensor (RX7 Shown)
Courtesy of Mazda Motors Corp.

Hall-Effect Sensors (Miata, MX-3, MX-6, Protege, 323, 626 & 929)

1) Remove distributor. Remove circuit opening relay and disconnect 3-pin connector from distributor. This will prevent coil sparking. Turn ignition on.

2) Using a voltmeter, backprobe power wire and ground wire at distributor. Voltmeter should display 12 volts. If voltage is not as specified, check ignition and ground circuits. Backprobe sensor wire (White wire on MX-3 1.6L or Violet/Green wire on MX-3 1.8L) at distributor. See HALL-EFFECT SENSOR VOLTAGE SPECIFICATIONS table for other models wire colors. Slowly rotate distributor shaft one turn. Voltmeter should pulse 0-5 volts 4 times (4-cylinder) or 6 times (V6).

3) Backprobe Yellow/Blue wire on MX-3 1.6L or Violet/White wire on MX-3 1.8L at distributor. See HALL-EFFECT SENSOR VOLTAGE SPECIFICATIONS table for other models wire

colors. Slowly rotate distributor shaft one turn. Voltmeter should pulse 0-5 volts one time. If either sensor does not work as described, turn ignition off. Disconnect 4-pin or 6-pin connector at distributor.

4) Turn ignition on. Ensure 5 volts are present at same wires which were checked in steps 2) and 3). If 5 volts are not present, check wiring and PCM. If 5 volts are present, replace distributor assembly.

HALL-EFFECT SENSOR VOLTAGE SPECIFICATIONS TABLE

Wire Color	Volts
MX-6 & 626 (2.0L)	
Red/Black (Power)	12
Orange (Sensor)	(1) 0-5
Yellow/White (Sensor)	(1) 0-5
Black/Blue (Ground)	0
MX-6 & 626 (2.5L)	
Red/Black (Power)	12
Purple (Sensor)	(1) 0-5
Light Green (Sensor)	(1) 0-5
Black/Red (Ground)	0
Miata, MX-3 (1.6L), Protege & 323	
White/Red (Power)	12
White (Sensor)	(1) 0-5
Yellow/Blue (Sensor)	(1) 0-5
Black/Lt. Green (Ground)	0
MX-3 (1.8L)	
White/Red (Power)	12
Violet/Green (Sensor)	(1) 0-5
Violet/White (Sensor)	(1) 0-5
Black/Lt. Green (Ground)	0
929	
Black/White (Power)	12
Green/White (Sensor)	(1) 0-5
Blue (Sensor)	(1) 0-5
Black/Lt. Green (Ground)	0

(1) - Voltage should fluctuate from 0-5 volts as engine is turned slowly.

CAUTION: While checking the ignitor, disconnect connector from the ignition coil.

Ignitor (B2200 w/Carburetor, MX-3 1.8L, MX-6 & 626)
Testing information is not available. If coil, PCM, sensor and wiring are okay, replace ignitor.

Ignitor (B2200 w/PFI, B2600i, Miata, MX-3 1.6L, Protege, 323 & 929)
1) Ensure coil and power source are okay before checking

ignitor. Disconnect coil ignitor connector. Install Ignitor Checker (49 F018 002) and Adapter Harness (49 N018 011 on MX-3 1.6L, Protege and 323; 49 N018 001 on all others). Connect the ignitor checker and adapter between the ignitor and wiring harness, connect the power leads to the battery.

2) Turn ignition on. Disconnect the high-tension coil lead from the distributor and hold it about 1/4" from ground. Flip the SW2 on and off, and verify a strong Blue spark is discharged from lead. If spark is weak in color, replace the coil. If no spark is present, check battery feed, main fuse, ignition switch and fusible links. Repair or replace as necessary.

CAUTION: DO NOT hold the SW2 switch on longer than one second.

3) Turn ignition on. Using voltmeter, check voltage on Black wire of adapter harness. Flip SW2 switch on and off. Verify voltmeter fluctuates. If voltmeter does not fluctuate, replace ignitor and retest.

Ignitor (MPV & 929)

1) Turn ignition off. Disconnect ignitor connector and install Test Harness (49 H018 001 on MPV or 49 N018 001 on 929). Using a needle-type ohmmeter, connect (+) lead to ground and (-) lead to single-pin test wire of test harness. See Fig. 6.

CAUTION: Ensure ohmmeter is installed with (+) lead to ground and (-) lead to single-pin wire of test harness. DO NOT reverse leads or damage may result.

2) Connect Ignitor Checker (49 F018 002 on MPV or 49 H018 910 on 929) to other lead of test harness and to battery. Set ohmmeter to X1 scale.

3) Turn ignition on. DO NOT touch ignitor checker SW1 switch. Push up ignitor checker SW2 switch and note ohmmeter reading. Ohmmeter needle should jump to 1/2 of the scale and then return. If ohmmeter does not operate as specified, replace ignitor.

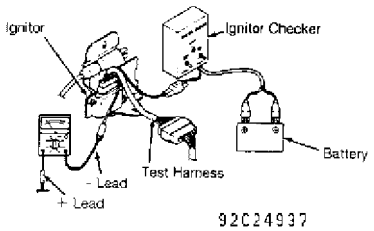


Fig. 6: Checking Ignitor (MPV & 929)
Courtesy of Mazda Motors Corp.

Ignitor (RX7)

1) Turn ignition off. Disconnect ignitor connector and install Test Harness (49 F018 003). Using a needle-type voltmeter, connect (+) lead to ground and (-) lead to Black test wire of test harness.

CAUTION: Ensure voltmeter is installed with (+) lead to ground and (-) lead to single-pin wire of test harness. DO NOT reverse leads or damage may result.

2) Connect Ignitor Checker (49 F018 002) to large lead of test harness and to battery. Turn ignition on. Ignitor checker SW1 switch may be in any position.

3) Ensure voltmeter displays 12 volts. Push up ignitor checker SW2 switch and note voltmeter reading. Voltmeter needle should jump or wiggle. Release SW2 switch. If voltmeter does not operate as specified, replace ignitor.

4) Repeat steps 1)-3) for Brown test wire and Gray test wire. If ignitor does not cause voltmeter needle to respond, replace ignitor.

IGNITION CHECKS (NAVAJO)

NOTE: While performing diagnostics, DO NOT connect Powertrain Control Module (PCM) to breakout box unless directed to do so.

NOTE: Perform following tests in sequence shown, unless test procedures indicate otherwise. For the following test, Electronic Distributorless Ignition System (EDIS) or Ignition Control Module (ICM) may be used to describe the ignition system.

NOTE: California models are equipped with a Camshaft Position Sensor (CMP). This sensor uses a Hall Effect switch and is located at top rear of engine. For testing information, see G - TESTS W/CODES article.

Initial Test

Check for any stored trouble codes and repair as necessary. See appropriate G - TESTS W/CODES article. Using a high-output spark plug tester, check for spark at all spark plugs. If spark is present at ALL spark plugs, go to CHECK PROFILE IGNITION PICKUP (PIP) AT ICM. If no spark is indicated or spark only occurs at some spark plugs, go to CHECKING PLUGS & WIRES.

Check Profile Ignition Pickup (PIP) At ICM

1) Turn key off. Connect ICM Diagnostic Cable (007-00059) to Breakout Box (T83L-50-EEC-IV), ICM and coil pack. DO NOT connect crankshaft Variable Reluctance Sensor (VRS) tee. See Fig. 7. Use ICM No. 6 overlay.

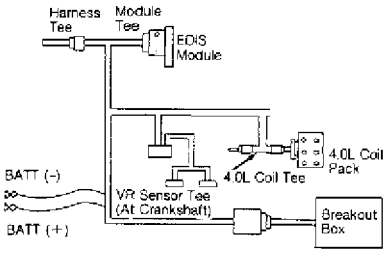


Fig. 7: Installing ICM Diagnostic Cable (Navajo)
Courtesy of Mazda Motors Corp.

2) Connect ICM diagnostic cable negative lead to battery, leaving positive lead disconnected. Set ICM diagnostic cable box to 4/6 CYLINDER position. Connect LED test light leads between breakout box pins No. J43 (PIP E) and J7 (ground). Crank engine. If LED test light blinks, go to step 3). If test light does not blink, go to ISOLATE ICM/PIP FAULT.

3) Turn key off. Disconnect PCM. Check continuity of PIP and Ignition Ground (IGND) wires between ICM and PCM. See Fig. 8. If any problems are found, repair circuits and components. Clear Continuous Memory, and run QUICK TEST in G - TESTS W/CODES article. If continuity is present and wires are not shorted or open, replace ICM.

Isolate ICM/PIP Fault

With key off, disconnect PCM. Connect LED test light leads between breakout box pins No. J43 (PIP E) and J7 (ground). Crank engine. If LED test light blinks, replace PCM. If test light does not blink, check PIP for short to ground or power. Repair any problems found. If no problems are found, replace ICM.

Checking Plugs & Wires

Crank engine. Using a high-output spark tester, check for spark at both spark plug wires of each coil. If there is no spark at all coils, go to CHECK FOR VBAT TO ICM. If spark is missing from both spark plug wires of one or 2 coils, go to CHECK VBAT FOR OPEN TO COIL. If spark is missing from one wire, replace spark plug wire and spark plug. Recheck ignition system.

Check For VBAT To ICM

Turn key off and disconnect PCM. Set DVOM to 20-volt scale. Turn ignition on. Measure voltage between breakout box pins No. (+) J51 (VBAT E) and (-) J7 (BAT negative). See Fig. 8. If voltage is greater than 10.5 volts, go to CHECK FOR GROUND OPEN TO ICM. If voltage is 10.5 volts or less, repair open or short in circuit from ignition switch.

Check For Ground Open To ICM

Turn key off and disconnect PCM. Measure resistance between breakout box pins J27 (PWR GND E) and chassis ground. If resistance is less than 5 ohms, go to CHECK VRS RESISTANCE. If resistance is 5 ohms

or more, repair open in ground circuit.

Check VRS Resistance

Turn key off and disconnect PCM. Connect negative lead of ICM diagnostic cable to negative battery terminal. Set DVOM to 20-k/ohm scale. Measure resistance between breakout box pins No. J48 (VRS

See Fig. 8. If resistance is 2580-2700 ohms, go to VRS SENSOR. If resistance is not 2580-2700 ohms, repair wires between VRS and ICM or replace VRS.

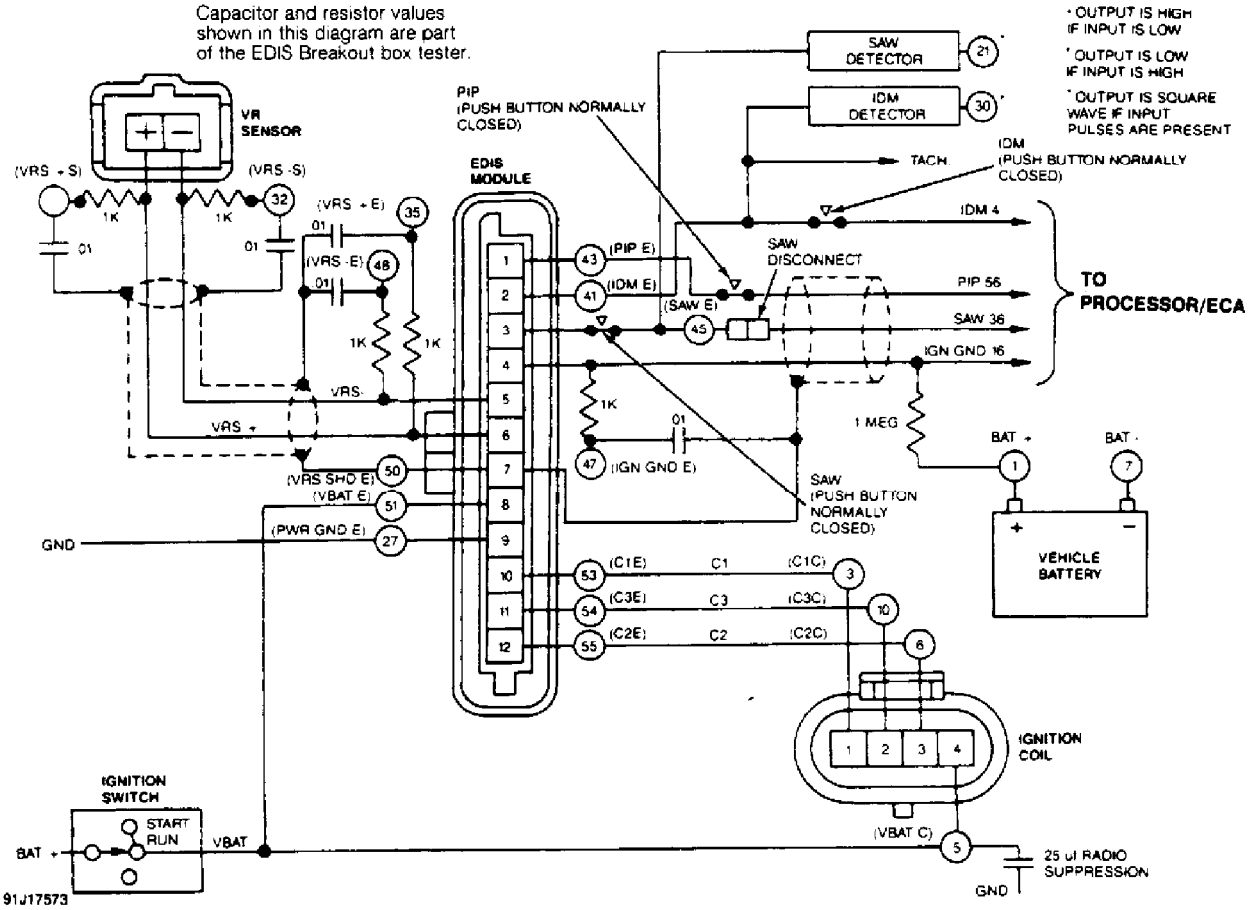


Fig. 8: Electronic Distributorless Ignition Control Module (ICM) Test Schematic (Navajo)
Courtesy of Mazda Motors Corp.

VRS Sensor

Ensure trigger wheel on crank pulley and VRS are not damaged. Ensure VRS is not touching trigger wheel. If no problems are found, disconnect ICM connector. Crank engine and check for slight A/C voltage at ICM harness terminals No. 5 and 6. See Fig. 8. If A/C voltage is not pulsing greater than one volt, check VRS circuits for opens or shorts. If no problems are found, replace VRS sensor. If A/C voltage pulses greater than one volt, go to CHECK VBAT OPEN TO COIL.

Check VBAT For Open To Coil

Turn key off and disconnect harness at coil pack. Turn key on. Measure voltage between coil pack harness terminal No. 4 and ground. If more than 10.5 volts are present, go to next step. If there is less than 10.5 volts, repair open circuit. Remove all test equipment and reconnect all components. Clear Continuous Memory and check for fault codes.

Verify Coil Operation

Crank engine. If there is no spark, go to CHECK C1, C2 & C3 AT COIL PACK (CRANKING). If spark is present at any coil, go to CHECK C1, C2 & C3 AT COIL PACK (RUNNING).

Check C1, C2 & C3 At Coil Pack (Cranking)

Turn key off. Reconnect harness at coil pack. Set DVOM on 20-volt AC scale. While cranking engine, backprobe between coil terminals No. 1, 2 and 3, and chassis ground. See Fig. 8. If any voltage reading while cranking is NOT 0.2-1.0 volt, go to CHECKING ICM CONTROL. If all voltage readings while cranking are 0.2-1.0 volt, go to CHECKING COIL PACK.

Check C1, C2 & C3 At Coil Pack (Running)

Turn key off. Reconnect harness at coil pack. Set DVOM on 20-volt AC scale. Start engine, backprobe between coil terminals No. 1, 2 and 3, and chassis ground. See Fig. 8. If any voltage reading while running is NOT 1.0-2.0 volts, go to CHECKING ICM CONTROL. If voltage reading of each coil (while running) is 1.0-2.0 volts, go to CHECKING COIL PACK.

Checking Coil Pack

Turn key off, and disconnect coil pack. Measure resistance between coil pack terminal No. 4 and all other terminals. See Fig. 8. If each resistance is greater than 0.8 ohm, replace coil pack. If any resistance is less than 0.5 ohm, replace coil pack and ICM. Remove all test equipment, and reconnect all components. Clear Continuous Memory and check for fault codes.

Checking ICM Control

If voltage was less than described in CHECK C1, C2 & C3 AT COIL PACK (RUNNING) or CHECK C1, C2 & C3 AT COIL PACK (CRANKING), replace coil pack. If voltage was greater than described, check circuits between coil pack and ICM module for opens or shorts. If circuits okay, replace ICM. Remove all test equipment, and reconnect all components. Clear Continuous Memory, and check for fault codes.

IDLE SPEED & IGNITION TIMING

Ensure idle speed and base ignition timing are set to specification. If necessary, see D - ADJUSTMENTS article.

IGNITION TIMING SPECIFICATIONS TABLE (Degrees BTDC @ RPM)

Application	Man. Trans.	(1) Auto. Trans.

B2200		
Carbureted	6 @ 825	6 @ 825
PFI (2)	6 @ 750	6 @ 770
B2600i (2)	5 @ 750	5 @ 770
Miata (3)	10 @ 850	8 @ 850
MPV		
2.6L (2)	N/A	5 @ 770
3.0L (2)	N/A	11 @ 800
MX-3		
1.6L (3)	10 @ 750	10 @ 750
1.8L (3)	10 @ 670	10 @ 670
MX-6 & 626		
2.0L (3)	12 @ 700	12 @ 700
2.5L (3)	10 @ 650	10 @ 650
Navajo	(4)	(4)
Protege		
DOHC (3)	10 @ 750	10 @ 750
SOHC (3)	5 @ 750	5 @ 750
RX7		
Leading (3)	(5) 20 @ 725	(5) 20 @ 725
Trailing (3)	(5) 5 @ 725	(5) 5 @ 725
323 (3)	7 @ 750	7 @ 750
929 (3)	N/A	12 @ 700

(1) - Place automatic transmission in Park.
(2) - Connect jumper wire between Green test connector and ground.
(3) - Connect jumper wire between terminals TEN and GRN of Green test connector.
(4) - Base (initial) timing is preset at 10 degrees BTDC and is not adjustable. To check timing, see D - ADJUSTMENTS article in ENGINE PERFORMANCE.
(5) - Timing specification is AFTER TDC and is not adjustable.

ÄÄ

SUMMARY

If no faults were found while performing BASIC DIAGNOSTIC PROCEDURES, proceed to appropriate G - TESTS W/CODES article. If no hard codes are found in self-diagnostics, proceed to appropriate H - TESTS W/O CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.) or intermittent diagnostic procedures.

END OF ARTICLE

G - TESTS W/CODES
Article Text
1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 06:38AM

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda Self-Diagnostics

RX7

INTRODUCTION

If no faults were found while performing F - BASIC TESTING, proceed with self-diagnostics. If no fault codes or only pass codes are present after entering self-diagnostics, proceed to appropriate H - TESTS W/O CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.).

SELF-DIAGNOSTIC SYSTEM

Hard Failures

Hard failures cause Malfunction Indicator Light (MIL) to illuminate and remain on until problem is repaired. If light comes on and remains on (light may flash) during vehicle operation, cause of malfunction must be determined using diagnostic (code) charts. See CODE CHARTS. If a sensor fails, ECU will use a substitute value in its calculations to continue engine operation. In this condition, commonly known as limp-in mode, the vehicle runs but driveability will not be optimum.

Intermittent Failures

Intermittent failures may cause Malfunction Indicator Light (MIL) to flicker or illuminate and go out after the intermittent fault goes away. However, the corresponding trouble code will be retained in ECU memory. If related fault does not reoccur within a certain time frame, related trouble code will be erased from ECU memory. Intermittent failures may be caused by a sensor, connector or wiring related problems. See INTERMITTENTS in TROUBLE SHOOTING - NO CODES article.

RETRIEVING CODES

Accessing Trouble Codes

1) Use Self-Diagnostic Checker (49 H018 9A1) and System Selector (49 B019 9A0) to retrieve trouble codes. Connect one lead of self-diagnostic checker to ground and the other to system selector. Connect system selector to data link connector. Connector is located on right inner fender panel in front of strut tower. See Fig. 1. If system selector is not available, connect a jumper wire between data link connector terminals TEN and GND. See PIN VOLTAGE CHARTS article for terminal identification.

2) With ignition on and engine stopped, observe Malfunction Indicator Light (MIL). Note trouble codes. Check TROUBLE CODE IDENTIFICATION chart for possible cause. If light remains on

continuously, MIL circuit is grounded or ECU is defective.

Memorized vs. Non-Memorized Codes

Some sensor or circuit failures are stored in ECU and are referred to as memorized codes. While other circuit failures, called non-memorized codes, are not stored. Non-memorized codes can be retrieved if ignition is not turned off before accessing codes.

NOTE: To access non-memorized trouble codes, DO NOT stop engine. Connect jumper wire across data link connector terminals TEN and GND. Observe MIL, and note trouble codes.

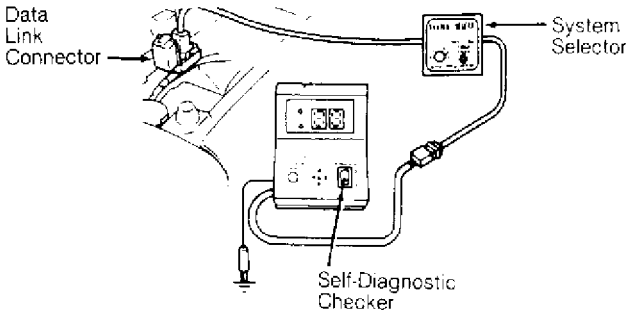


Fig. 1: Connecting Data Link Connector To System Selector
Courtesy of Mazda Motors Corp.

AFTER-REPAIR PROCEDURE

After indicated service or replacement is performed, clear codes. See CLEARING CODES. Recheck ECU memory. No codes should be present. If codes are present, see appropriate trouble code chart under CODE CHARTS to repair vehicle.

CLEARING CODES

Clearing Trouble Codes

Disconnect negative battery cable, and depress brake pedal for at least 20 seconds. Reconnect battery cable. Reconnect self-diagnostic checker and system selector. See Fig. 1. Turn ignition on, but DO NOT start engine for 6 seconds. Start and run engine at 2000 RPM for 3 minutes. Verify no codes are displayed.

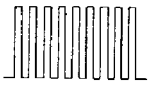
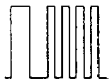
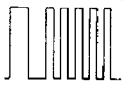
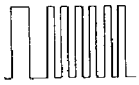
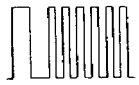
NOTE: See PIN VOLTAGE CHARTS article to identify ECU connector terminals.

TROUBLE CODE CHARTS

TROUBLE CODE IDENTIFICATION

NOTE: * If there is more than one failure present, codes will be sequentially displayed in order of lowest to highest.
* After repairing a failure, turn ignition switch off. Disconnect negative battery cable, and depress brake pedal for at least 20 seconds to erase malfunction code from ECU memory.

TROUBLE CODE IDENTIFICATION

No.	Indicator flashing pattern	Diagnosed circuit	Condition	Point	Memorized
02	ON / OFF 	Crank angle sensor (NE signal)	No NE signal	• Crank angle sensor connector • Wiring from crank angle sensor to ECU • Crank angle sensor	Yes
03	ON / OFF 	Crank angle sensor (G signal)	No G signal	• Crank angle sensor connector • Wiring from crank angle sensor to ECU • Crank angle sensor	Yes
05	ON / OFF 	Knock sensor	Open or shout circuit	• Knock sensor connector • Wiring from knock sensor to ECU • Knock sensor	Yes
06	ON / OFF 	Speedometer Sensor	No speed mete: sensor signal	• Speedometer sensor connector • Wiring from speedometer sensor to ECU	Yes
09	ON / OFF 	Water thermosensor	Open or short circuit	• Water thermosensor connector • Wiring from water thermosensor to ECU • Water thermosensor resistance	Yes
11	ON / OFF 	Intake air thermosensor		• Intake air thermosensor connector • Wiring from intake air thermosensor to ECU • Intake air thermosensor resistance	Yes
12	ON / OFF 	Throttle sensor (Full range)		• Throttle sensor connector • Wiring from throttle sensor to ECU	Yes
13	ON / OFF 	Pressure sensor		• Pressure sensor connector • Wiring from pressure sensor to ECU • Pressure sensor resistance	Yes
14	ON / OFF 	Atmospheric pressure sensor (in ECU)		• ECU	Yes
15	ON / OFF 	Oxygen sensor	Sensor output continues less than 0.55V 25 sec. in feedback zone	• Oxygen sensor connector • Wiring from oxygen sensor to ECU • Oxygen sensor	Yes
16	ON / OFF 	EGR switch (California only)	Open or short circuit	• EGR switch connector • Wiring from EGR switch to ECU • EGR switch	Yes
17	ON / OFF 	Feedback system	Sensor output not changed 120 sec. in feedback zone	• Fuel pressure • Injection fuel leakage • Ignition system • Air leakage • ECU	Yes
18	ON / OFF 	Throttle sensor (Narrow range)	Open or short circuit	• Throttle sensor connector • Wiring from throttle sensor to ECU	Yes

93H80603

Fig. 2: Trouble Code Identification (1 Of 4)
Courtesy Of Mazda Motors Corp.

TROUBLE CODE IDENTIFICATION (Cont.)

No.	Indicator flashing pattern	Diagnosed circuit	Condition	Point	Memorized
20	ON / OFF 	Metering oil pump position sensor	Open or Short circuit	• MOP connector • Wiring from MOP position sensor to ECU • MOP position sensor continuity	Yes
23	ON / OFF 	Fuel thermosensor		• Fuel thermosensor connector • Wiring from Fuel thermosensor to ECU • Fuel thermosensor resistance	Yes
25	ON / OFF 	Solenoid valve (pressure regulator control)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No
26	ON / OFF 	Metering oil pump (stepping motor)		• MOP connector • Wiring from MOP to ECU • MOP continuity	No
27	ON / OFF 	Metering oil pump	Open or short circuit or Sticking of MOP sensor	• MOP connector • Wiring from MOP to ECU • Mop continuity	Yes
28	ON / OFF 	Solenoid valve (EGR)	Open or short circuit	• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No
30	ON / OFF 	Solenoid valve (Split air bypass)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No
31	ON / OFF 	Solenoid valve (Relief 1)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No
32	ON / OFF 	Solenoid valve (Switching)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No
33	ON / OFF 	Solenoid valve (Port air bypass)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No
34	ON / OFF 	Solenoid valve (Idle speed control)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No
37	ON / OFF 	Metering Oil Pump	Low battery voltage	• Charging system • MOP connector • Wiring from MOP to ECU	Yes

93I80604

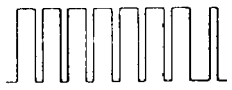
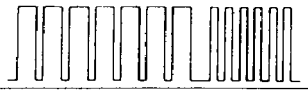
Fig. 3: Trouble Code Identification (2 Of 4)
Courtesy Of Mazda Motors Corp.

TROUBLE CODE IDENTIFICATION (Cont.)

No.	Indicator flashing pattern	Diagnosed circuit	Condition	Point	Memorized
38	ON / OFF 	Solenoid valve (Accelerated warm-up system)	Open or Short Circuit	• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No
39	ON / OFF 	Solenoid valve (Relief 2)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No
40	ON / OFF 	Solenoid valve (Purge control)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No
42	ON / OFF 	Solenoid valve (Turbo precontrol)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No
43	ON / OFF 	Solenoid valve (Wastegate control)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No
44	ON / OFF 	Solenoid valve (Turbo control)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No
45	ON / OFF 	Solenoid valve (Charge control)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No
46	ON / OFF 	Solenoid valve (Charge relief)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No
50	ON / OFF 	Solenoid valve (Double throttle control)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No
51	ON / OFF 	Fuel pump relay		• Fuel pump relay connector • Wiring from relay to ECU • Relay continuity	No
54	ON / OFF 	Air pump relay		• Air pump relay connector • Wiring from relay to ECU • Relay continuity	No

93J80605

Fig. 4: Trouble Code Identification (3 Of 4)
Courtesy Of Mazda Motors Corp.

No.	Indicator flashing pattern	Diagnosed circuit	Condition	Point	Memorized
71	ON / OFF 	Injector (Front secondary)	Open circuit	• Injector connector • Wiring from Injector to ECU • Injector resistance	No
73	ON / OFF 	Injector (Rear secondary)		• Injector connector • Wiring from injector to ECU • Injector resistance	No
76	ON / OFF 	Slip Lock up off Signal (EC-AT CU)	Open or Short circuit	• EC-AT CU connector • Wiring from EC AT CU to ECU	No
77	ON / OFF 	Torque reduced signal (EC-AT CU)		• EC-AT CU connector • Wiring from EC-AT CU to ECU	No

Note

- If there is more than one failure present, codes will be sequentially displayed in order of lowest to highest.
- After repairing a failure, turn ignition switch off. Disconnect negative battery cable, and depress brake pedal for at least 20 seconds to erase malfunction code from ECU memory.

93A80606

Fig. 5: Trouble Code Identification (4 Of 4)
Courtesy Of Mazda Motors Corp.

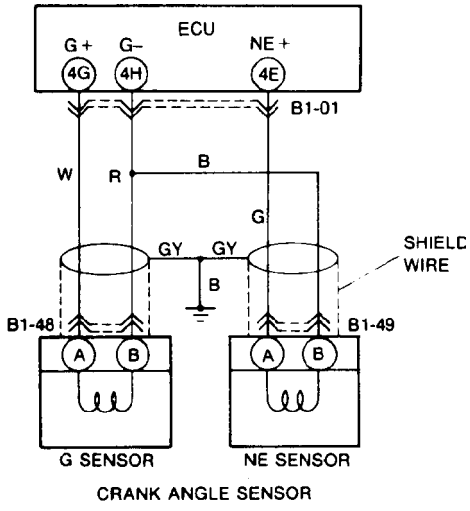
TROUBLE CODE NO. 2 (CRANK ANGLE SENSOR - NE SENSOR)

TROUBLE CODE NO. 2 (CRANK ANGLE SENSOR – NE SENSOR)

STEP	INSPECTION		ACTION
1	Is Code No.03 also present?	Yes	Go to next step
		No	Go to step 5
2	Does crank angle sensor circuit have poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
3	Is resistance of crank angle sensor [NE SENSOR] OK? **Resistance: 0.95-1.25 k/ohm (20°C [68°F])**	Yes	Go to next step
		No	Replace crank angle sensor [NE SENSOR]
4	Is clearance of crank angle sensor [NE signal] OK? **Clearance: 1.0–2.0 mm (0.039–0.078 In)**	Yes	Go to next step
		No	Adjust clearance
5	Is there continuity between ground and 4E or ground and 4H terminal? (at harness side)	Yes	Check for short circuit in wiring (Crank angle sensor–4H or 4E terminal)
		No	Go to next step
6	Disconnect connector from ECU; is resistance between 4E (G) and 4H (R) terminals OK? **Resistance: 0.95–1.25 KΩ (20°C [68°F])**	Yes	Replace ECU
		No	Check for open circuit in wiring (Crank angle sensor–4H or 4E terminal)

93B80607

Fig. 6: Trouble Code No. 2 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93C80608

Fig. 7: Trouble Code No. 2 - Schematic
Courtesy Of Mazda Motors Corp.

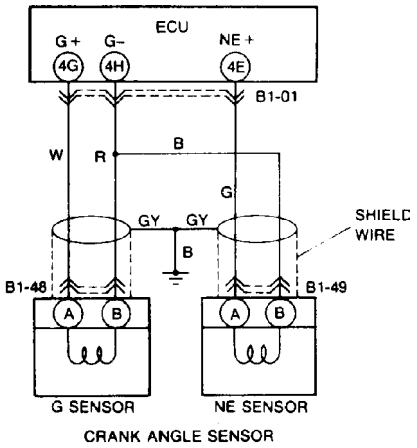
TROUBLE CODE NO. 3 (CRANK ANGLE SENSOR - G SENSOR)

TROUBLE CODE NO. 3 (CRANK ANGLE SENSOR – G SENSOR)

STEP	INSPECTION		ACTION
1	Is Code No.02 also present?	Yes	Go to next step
		No	Go to step 5
2	Does crank angle sensor circuit have poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
3	Is resistance of crank angle sensor [G SENSOR] OK? **Resistance: 0.95-1.25 k/ohm (20°C [68°F])**	Yes	Go to next step
		No	Replace crank angle sensor [G SENSOR]
4	Is clearance of crank angle sensor [G signal] OK? **Clearance: 1.0–2.0 mm (0.039–0.0178 in)**	Yes	Go to step
		No	Adjust clearance
5	Is there continuity between ground and 4G or ground and 4H terminal? (at harness side)	Yes	Check for short circuit in wiring (Crank angle sensor–4H or 4G terminal)
		No	Go to next step
6	Disconnect connector from ECU; is resistance between 4G (W) and 4H (R) terminals OK? **Resistance: 0.95–1.25 KΩ (20°C [68°F])**	Yes	Replace ECU
		No	Check for open circuit in wiring (Crank angle sensor–4G or 4H terminal)

93D80609

Fig. 8: Trouble Code No. 3 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93C80608

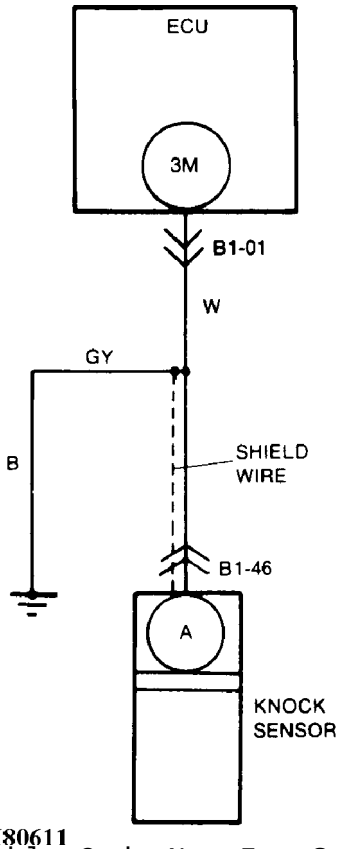
Fig. 9: Trouble Code No. 3 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 5 (KNOCK SENSOR)

TROUBLE CODE NO. 5 (KNOCK SENSOR)

STEP	INSPECTION		ACTION
1	Does knock sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is there continuity between knock sensor and ECU terminal 3M (W)?	Yes	Check continuity between ECU terminal 3M (W) and ground ⇨ If continuity, repair or replace wiring ⇨ If no continuity, go to next step
		No	Repair wiring harness
3	Try known good knock sensor, is same code No. present?	Yes	Replace ECU
		No	Replace knock sensor

93G80610
Fig. 10: Trouble Code No. 5 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93H80611
Fig. 11: Trouble Code No. 5 - Schematic
Courtesy Of Mazda Motors Corp.

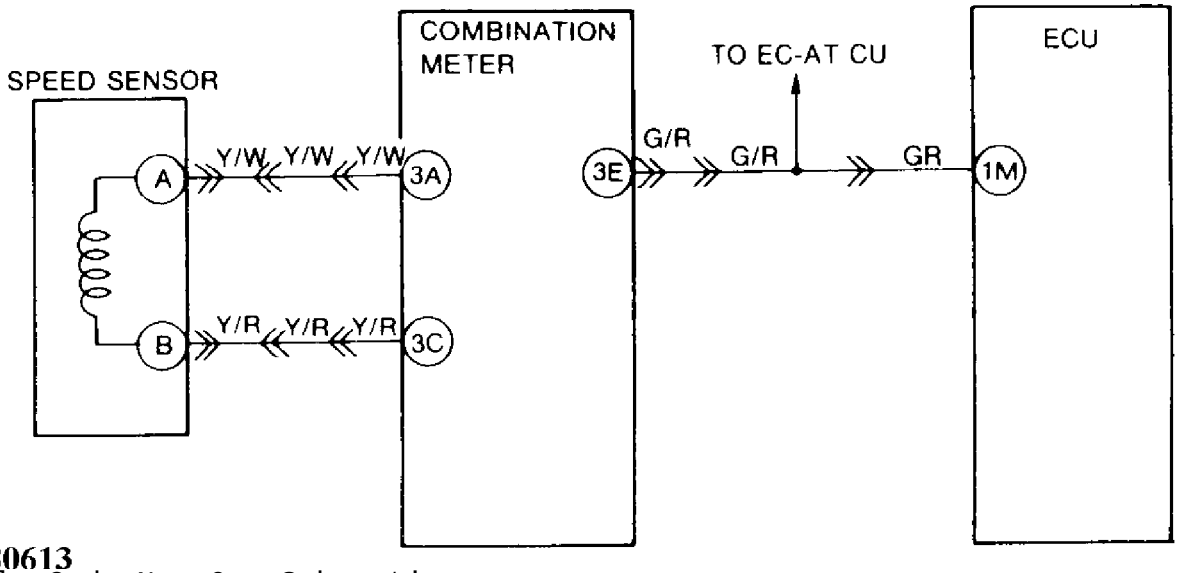
TROUBLE CODE NO. 6 (SPEEDOMETER SENSOR)

TROUBLE CODE NO. 6 (SPEEDOMETER SENSOR)

STEP	INSPECTION		ACTION
1	Is speedometer working correctly ?	Yes	Go to next step
		No	Go to step 5
2	Check for EC-AT CU service code. Is code No.07 also present?	Yes	Go to step 5
		No	Go to next step
3	Does speedometer sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
4	Is there speedometer sensor terminal 1M (G/R) voltage OK? Condition: While driving — Voltage: 2–3V Condition: Idle — Voltage: 4–5V	Yes	Check for open or short circuit wiring harness (Speedometer sensor terminal 3E (G/R)-ECU terminal 1M) ⇨ If OK go to step 8 ⇨ If not OK, repair wiring harness.
		No	Replace speedometer
5	Remove speed sensor Is resistance felt when turning speedometer driven gear by hand ?	Yes	Go to next step
		No	Replace speed sensor
6	Disconnect speed sensor connector and connect circuit tester Does pointer of circuit tester move slightly when driven gear is slowly turned?	Yes	Go to next step
		No	Replace speed sensor
7	Disconnect speed sensor connector Is continuity of sensor OK? **Resistance: Approx. 290 Ω (20°C [68°F]); (reference)**	Yes	Check wiring and connectors from speed sensor to speedometer ⇨ If OK, go to next step ⇨ If not OK, repair wiring and/or connector
		No	Replace speed sensor
8	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU
		No	Intermittent poor connection Check for cause

93I80612

Fig. 12: Trouble Code No. 6 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93J80613

Fig. 13: Trouble Code No. 6 - Schematic
Courtesy Of Mazda Motors Corp.

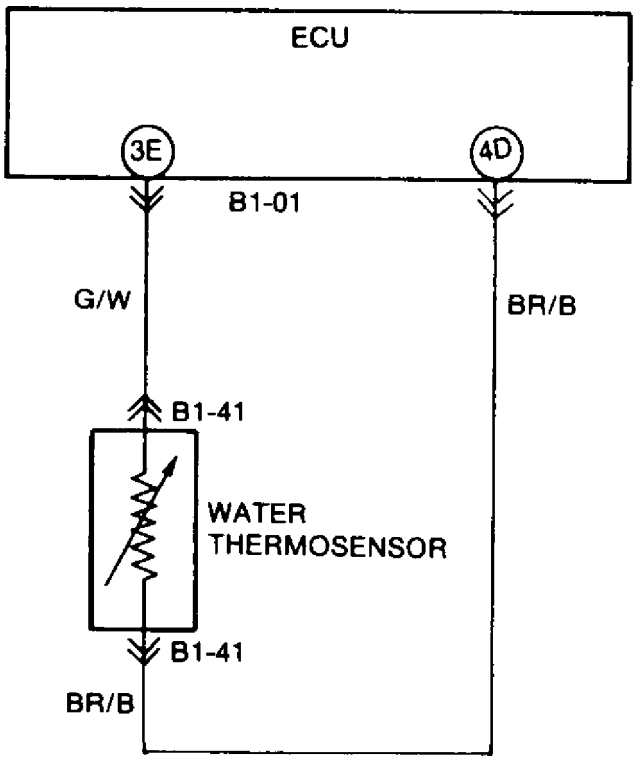
TROUBLE CODE NO. 9 (WATER THERMOSENSOR)

TROUBLE CODE NO. 9 (WATER THERMOSENSOR)

STEP	INSPECTION		ACTION
1	Does the water thermosensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is water thermosensor terminal (G/W) Voltage OK with water thermosensor connector disconnected? **Condition** / **Voltage**: Ignition switch ON / Approx. 5.0V	Yes	Go to next step
		No	Check for short or open circuit in wiring harness (Water thermosensor terminal [G/W]--ECU terminal 3E) ⇨ If OK, replace ECU ⇨ If not OK, repair wiring harness
3	Is there continuity between water thermosensor terminal (BR/B) and a ground	Yes	Go to next step
		No	Repair wiring harness
4	Is resistance of water thermosensor OK? Coolant temp. / Resistance {kΩ}: –20°C {–4°F} / 14.6–17.8; 20°C {68°F} / 2.2–2.7; 80°C {176°F} / 0.29–0.35	Yes	Replace ECU
		No	Replace water thermosensor

93A80614

Fig. 14: Trouble Code No. 9 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93B80615

Fig. 15: Trouble Code No. 9 - Schematic
Courtesy Of Mazda Motors Corp.

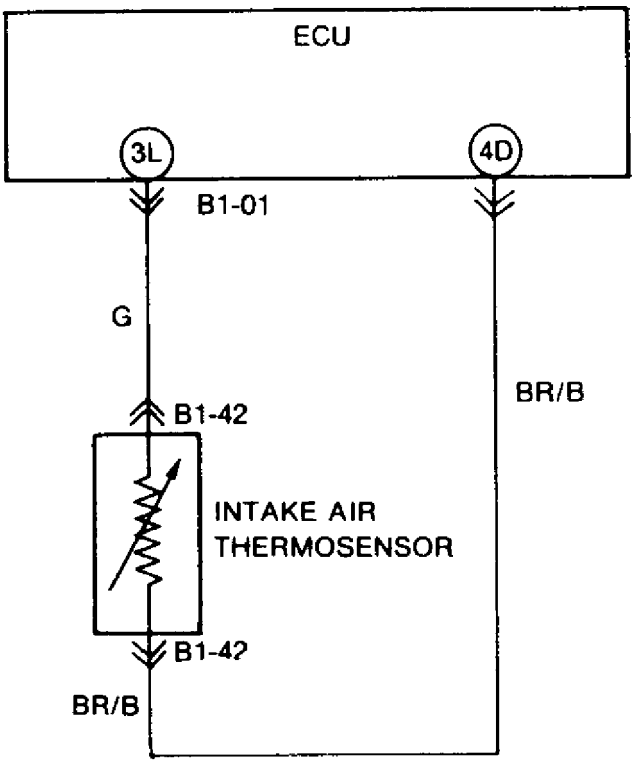
TROUBLE CODE NO. 11 (INTAKE AIR THERMOSENSOR)

TROUBLE CODE NO. 11 (INTAKE AIR THERMOSENSOR)

STEP	INSPECTION		ACTION
1	Does the water thermosensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is Intake air thermosensor terminal (G) voltage OK with Intake air thermosensor connector disconnected? Condition: Ignition switch ON — Voltage: Approx. 5.0V	Yes	Go to next step
		No	Check for short or open circuit in wiring harness (intake air thermosensor terminal [G]-ECU terminal 3L) ⇨ If OK, replace ECU ⇨ If not OK, repair wiring harness
3	Is there continuity between intake air thermosensor terminal (BR/B) and a ground	Yes	Go to next step
		No	Repair wiring harness
4	Is resistance of Intake air thermosensor OK? Temperature: 20°C (68°F) — Resistance (kΩ): 2.2–2.7 Temperature: 85°C (185°F) — Resistance (kΩ): 0.29–0.35	Yes	Replace ECU
		No	Replace intake air thermosensor

93C80616

Fig. 16: Trouble Code No. 11 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93D80617

Fig. 17: Trouble Code No. 11 - Schematic
Courtesy Of Mazda Motors Corp.

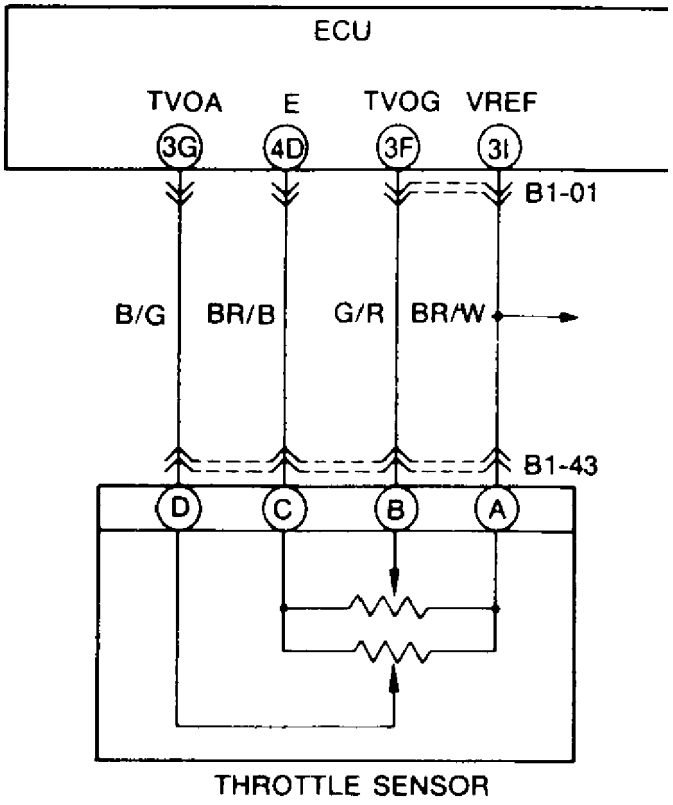
TROUBLE CODE NO. 12 (THROTTLE SENSOR - FULL RANGE)

TROUBLE CODE NO. 12 (THROTTLE SENSOR – FULL RANGE)

STEP	INSPECTION		ACTION
1	Does throttle sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is throttle sensor terminal (BR/W) voltage OK with throttle sensor disconnected? Condition: Ignition switch ON; Voltage: Approx. 5.0V	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Throttle sensor terminal (BR/W)-ECU terminal 3I) ⇨ If OK, replace ECU ⇨ If not OK, repair wiring harness
3	Is there continuity between throttle sensor and ECU? Throttle sensor (B/G) – ECU 3G (B/G) Throttle sensor (BR/B) – ECU 4D (BR/B)	Yes	Check for short circuit in wiring harness (Throttle sensor terminal (B/G)-ECU terminal 3G) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is there continuity between terminals (BR/W) and (B/G) with throttle valve fully closed to fully opened?	Yes	Replace ECU
		No	Replace throttle sensor

93E80618

Fig. 18: Trouble Code No. 12 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93F80619

Fig. 19: Trouble Code No. 12 - Schematic
Courtesy Of Mazda Motors Corp.

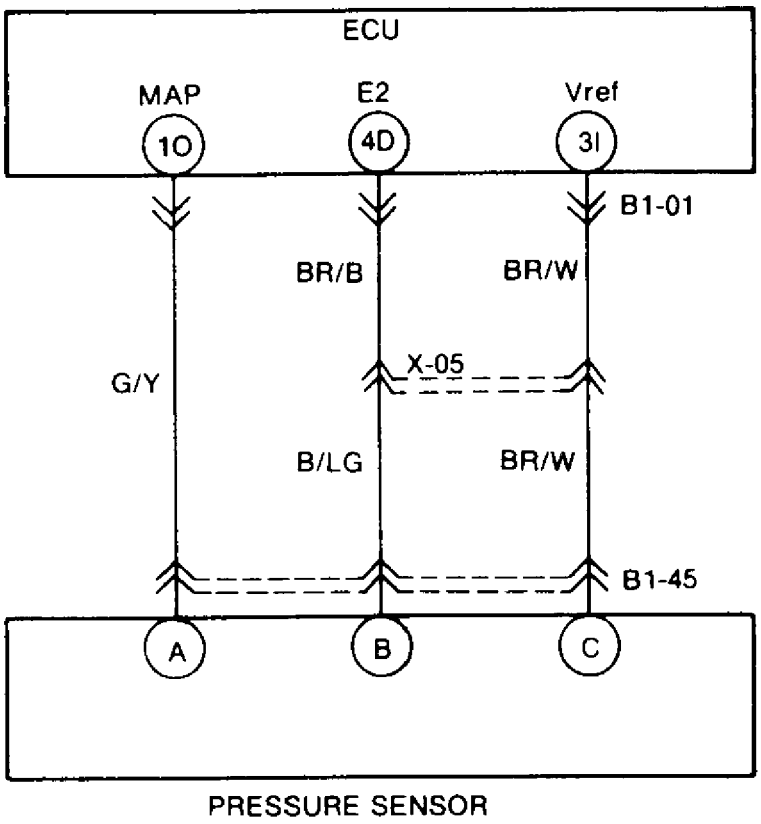
TROUBLE CODE NO. 13 (PRESSURE SENSOR)

TROUBLE CODE NO. 13 (PRESSURE SENSOR)

STEP	INSPECTION		ACTION
1	Does pressure sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (BR/W) voltage OK with pressure sensor connector disconnected? Condition: Ignition switch ON; Voltage: Approx. 5V	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (pressure sensor terminal [BR/W] ECU relay terminal [BR/W])
3	Is there continuity between pressure sensor terminal (BR/B) and ECU terminal 4D	Yes	Go to next step
		No	Repair wiring harness
4	Is output voltage (G/Y) of pressure sensor OK? Pressure or Vaccum: – 66 kPa (– 500 mmHg, 19.7 inHg) — Voltage: 1.3–1.6V 0 kPa (0 mmHg, 0 inHg) — 2.3–2.8V 98.7 kPa (740 mmHg, 29.1 inHg) — 4.3–4.6V	Yes	Replace ECU
		No	Replace pressure sensor

93I80620

Fig. 20: Trouble Code No. 13 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93J80621

Fig. 21: Trouble Code No. 13 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 14 (ATMOSPHERIC PRESSURE SENSOR)

* Replace ECU

TROUBLE CODE NO. 15 (OXYGEN SENSOR)

TROUBLE CODE NO. 15 (OXYGEN SENSOR)

Note
• If Codes No. 15 and 17 are both present, first perform the checking procedure for Code No. 17.

STEP	INSPECTION		ACTION
1	Does oxygen sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is oxygen sensor output voltage OK?	Yes	Go to next step
		No	Replace oxygen sensor
3	Is there continuity between oxygen sensor and ECU terminal 3C (B)?	Yes	Check for short circuit in wiring ⇨ If OK, replace ECU ⇨ If not OK, repair wire harness
		No	Repair wiring harness

93B80623

Fig. 22: Trouble Code No. 15 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.

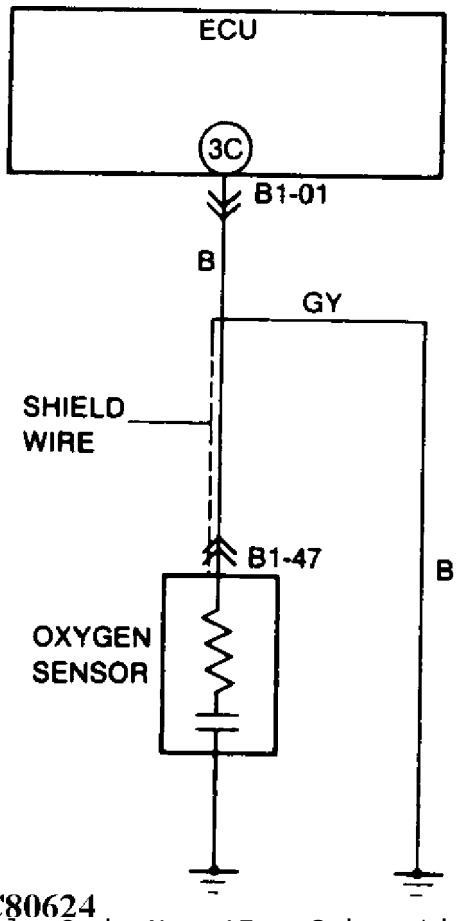


Fig. 23: Trouble Code No. 15 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 16 (EGR SWITCH - CA)

TROUBLE CODE NO. 16 (EGR SWITCH – CALIFORNIA)

STEP	INSPECTION		ACTION
1	Does EGR switch circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (L/G) voltage OK with EGR switch connector disconnected.	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (EGR switch terminal [LG]-ECU terminal 3J)
3	Is there continuity between EGR switch terminal (BR/B) and ECU terminal 4F?	Yes	Go to next step
		No	Repair wiring harness
4	Is EGR switch OK?	Yes	Replace ECU
		No	Replace EGR valve

93D80625

Fig. 24: Trouble Code No. 16 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.

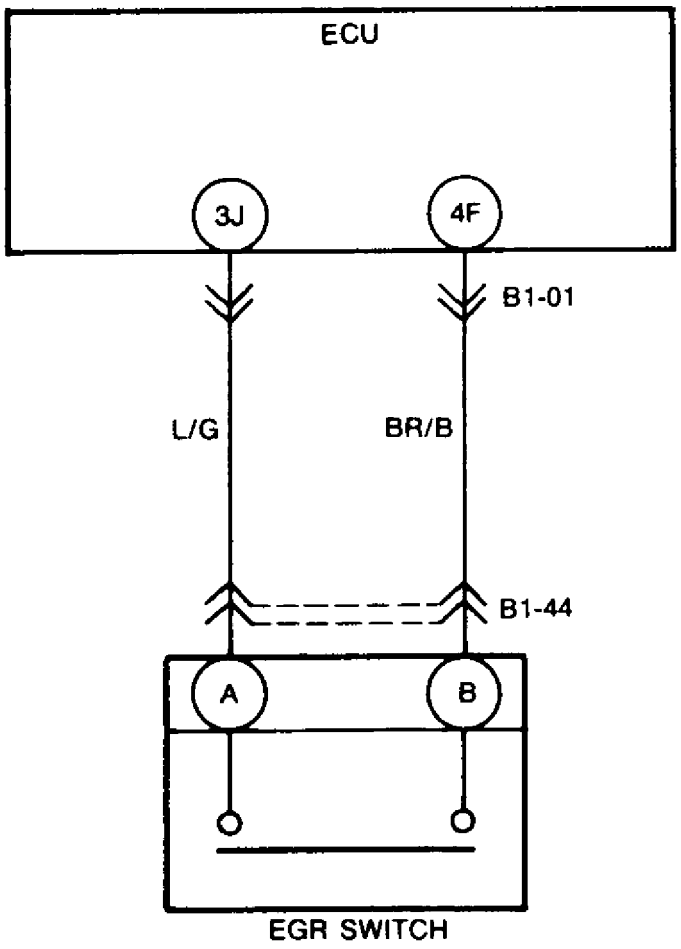


Fig. 25: Trouble Code No. 16 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 17 (FEEDBACK SYSTEM)

TROUBLE CODE NO. 17 (FEEDBACK SYSTEM) 1 OF 2

STEP	INSPECTION		ACTION
1	Is same code No. present following after-repair procedure? * * – See AFTER-REPAIR PROCEDURE under SELF-DIAGNOSTIC SYSTEM.	Yes	Go to next step
		No	Check oxygen sensor circuit for a poor connection ⇨ If OK, perform troubleshooting Code No.15
2	Does monitor lamp of Self-Diagnosis Checker illuminate at idle after the engine has been warmed up and run at **2500–3000 rpm** for **3 min**?	Yes	Go to next step **Note** **• A/F mixture rich**
		No	Go to Step 5 **Note** **• A/F mixture is lean or misfire is occurring**
3	Is fuel line pressure correct at idle? **Fuel line pressure:** **190-220 kPa 1.9-2.3 kg/cm², 28-32 psi**	Yes	Go to next step
		No	**High pressure** Check if fuel return hose is clogged or restricted ⇨ If OK, replace pressure regulator
4	Is there fuel leakage at injector?	Yes	Replace injector
		No	Check water thermosensor ⇨ If it is OK, replace oxygen sensor ⇨ If it is not OK, replace it
5	Disconnect each high tension lead at idle: does engine speed decrease equally at each rotor?	Yes	Go to next step
		No	Go to Step 8
6	Is fuel line pressure correct at idle? **Fuel line pressure:** **190-220 kPa 1.9-2.3 kg/cm², 28-32 psi**	Yes	Go to next step
		No	**Low pressure** Check fuel line pressure while pinching fuel return hose ⇨ If it **quickly** increases, check pressure regulator ⇨ If it **gradually** increases, check for clogging between fuel pump and pressure regulator ⇨ If hose is not clogged, check fuel pump maximum pressure
7	Is there air leakage in intake air system components?	Yes	Replace oxygen sensor
		No	Repair
8	Is there a misfire of a dead rotor from Step 5 inspection?	Yes	Repair or replace ignition system component(s)
		No	Go to next step

93F80627

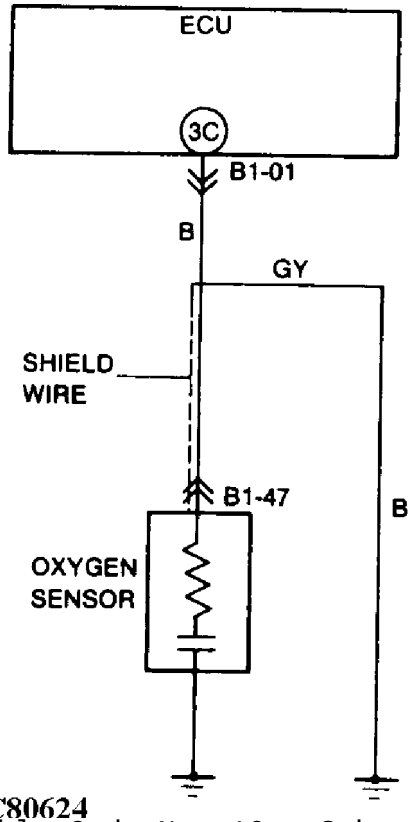
Fig. 26: Trouble Code No. 17 - Diagnostic Flowchart (1 Of 2)
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 17 (FEEDBACK SYSTEM) 2 OF 2

STEP	INSPECTION		ACTION
9	Is there an injector operating sound at idle of dead rotor from Step 5 inspection?	Yes	Go to next step
		No	Check for approx. 12V at injector terminal wire ⇨ If there is, replace injector ⇨ If there is not, check for a short or open circuit in wire harness
10	Replace injector at dead rotor from Step 5 inspection Is same code No. present following after-repair procedure? *	Yes	Try known good ECU
		No	System OK

* - See AFTER-REPAIR PROCEDURE under SELF-DIAGNOSTIC SYSTEM.

93G80628
Fig. 27: Trouble Code No. 17 - Diagnostic Flowchart (2 Of 2)
Courtesy Of Mazda Motors Corp.



93C80624
Fig. 28: Trouble Code No. 16 - Schematic
Courtesy Of Mazda Motors Corp.

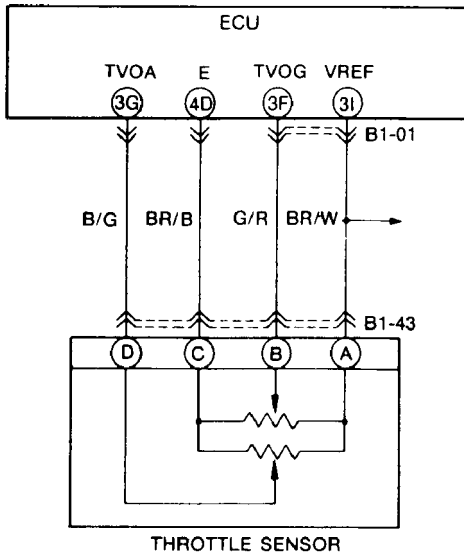
TROUBLE CODE NO. 18 (THROTTLE SENSOR - NARROW RANGE)

TROUBLE CODE NO. 18 (THROTTLE SENSOR – NARROW RANGE)

STEP	INSPECTION		ACTION
1	Does throttle sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is throttle sensor terminal (BR/W) voltage OK with throttle sensor disconnected? Condition: Ignition switch ON — Voltage: Approx. 5.0V	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Throttle sensor terminal [BR/W]-ECU terminal 3I) ⇨ If OK, replace ECU ⇨ If not OK, repair wiring harness
3	Is there continuity between throttle sensor and ECU? Throttle sensor (G/R) — ECU 3F (G/R) Throttle sensor (BR/B) — ECU 4D (BR/B)	Yes	Check for short circuit in wiring harnes (Throttle sensor terminal (G/R)-ECU terminal 3F) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is there continuity between terminals (BR/W) and (G/R) with throttle valve fully closed to fully opened?	Yes	Replace ECU
		No	Replace throttle sensor

93H80629

Fig. 29: Trouble Code No. 18 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93F80619

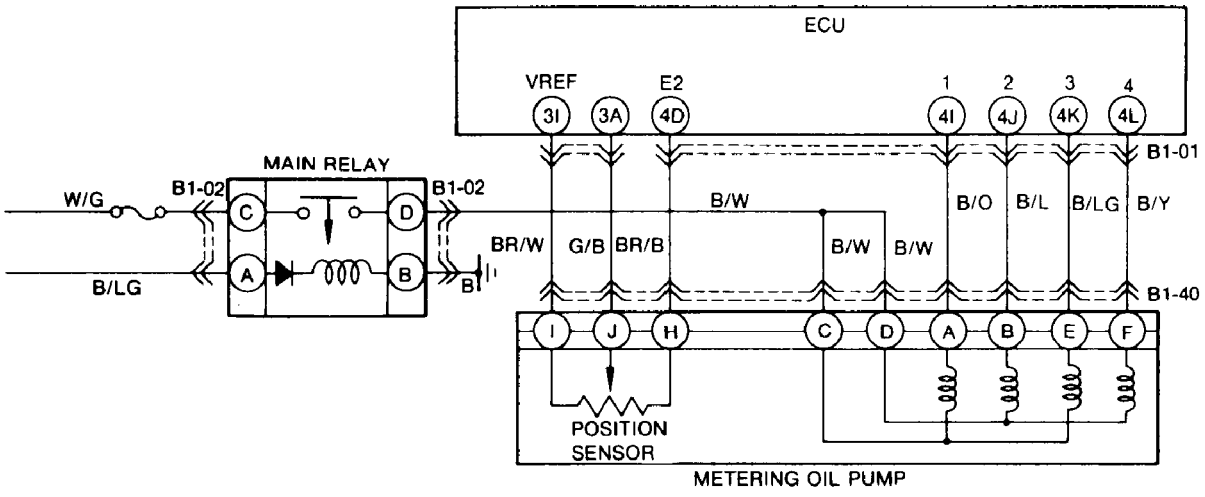
Fig. 30: Trouble Code No. 18 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 20 (METERING OIL PUMP POSITION SENSOR)

TROUBLE CODE NO. 20 (METERING OIL PUMP POSITION SENSOR)

STEP	INSPECTION		ACTION
1	Are there any poor conections at metering oil pump and ECU connectors?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECU terminal 3A (G/B) voltage OK? Condition: Idle — Voltage: 1.1V Condition: Acceleration — Voltage: 1.1V–4.2V	Yes	Go to step 4
		No	Go to next step
3	Is resistance of MOP position sensor OK? Resistance: J–H 0.4–12 kΩ J–I 1.0–2 kΩ H–I 0.4–12 kΩ	Yes	Repair wiring harness (Mop position sensor-ECU terminal 3A)
		No	Replace MOP
4	Disconnect negative battery cable for at least 20 seconds Connect battery cable, and recheck for service code Is service code displayed?	Yes	Replace ECU
		No	Intermittent poor connection check for cause.

93A80630
Fig. 31: Trouble Code No. 20 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93B80631
Fig. 32: Trouble Code No. 20 - Schematic
Courtesy Of Mazda Motors Corp.

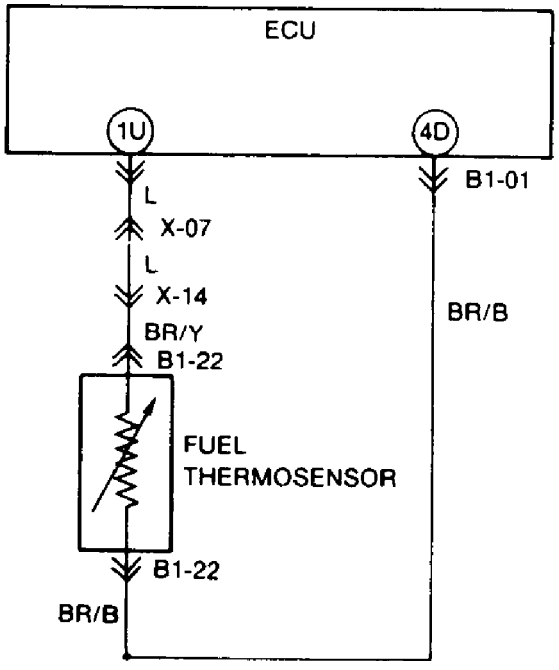
TROUBLE CODE NO. 23 (FUEL THERMOSENSOR)

TROUBLE CODE NO. 23 (FUEL THERMOSENSOR)

STEP	INSPECTION		ACTION
1	Does the fuel thermosensor circuit have a poor connection?	Yes	Repair connector and/or harness
		No	Go to next step
2	Is fuel thermosensor terminal (BR/B) voltage OK with fuel thermosensor connector disconnected? Condition: Ignition switch ON — Voltage: Approx. 5.0 V	Yes	Go to next step
		No	Check for short or open circuit in wiring harness (fuel thermosensor terminal [BR/B]-ECU terminal 1U) ⇨ If OK, replace ECU ⇨ If not OK, repair wiring harness
3	Is there continuity between fuel thermosensor terminal (BR/Y) and a ground?	Yes	Go to next step
		No	Repair wiring harness
4	Is resistance of fuel thermosensor OK? Fuel temp: – 20°C {– 4°F} — Resistance {kΩ}: 14.6–17.8 Fuel temp: 20°C {68°F} — Resistance {kΩ}: 2.2–2.7 Fuel temp: 80°C {176°F} — Resistance {kΩ}: 0.29-0.35	Yes	Replace ECU
		No	Replace fuel thermosensor

93C80632

Fig. 33: Trouble Code No. 23 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93D80633

Fig. 34: Trouble Code No. 23 - Schematic
Courtesy Of Mazda Motors Corp.

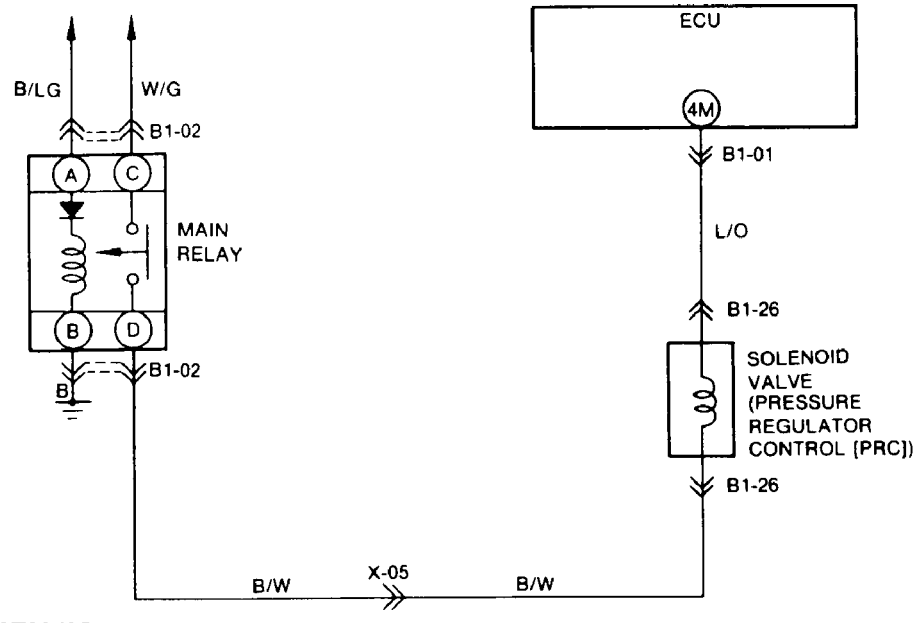
TROUBLE CODE NO. 25 (SOLENOID VALVE - PRESSURE REGULATOR CONTROL)

TROUBLE CODE NO. 25 (SOLENOID VALVE – PRESSURE REGULATOR CONTROL)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/O) and ECU terminal 4M?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/O]–ECU terminal 4M) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93E80634

Fig. 35: Trouble Code No. 25 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93F80635

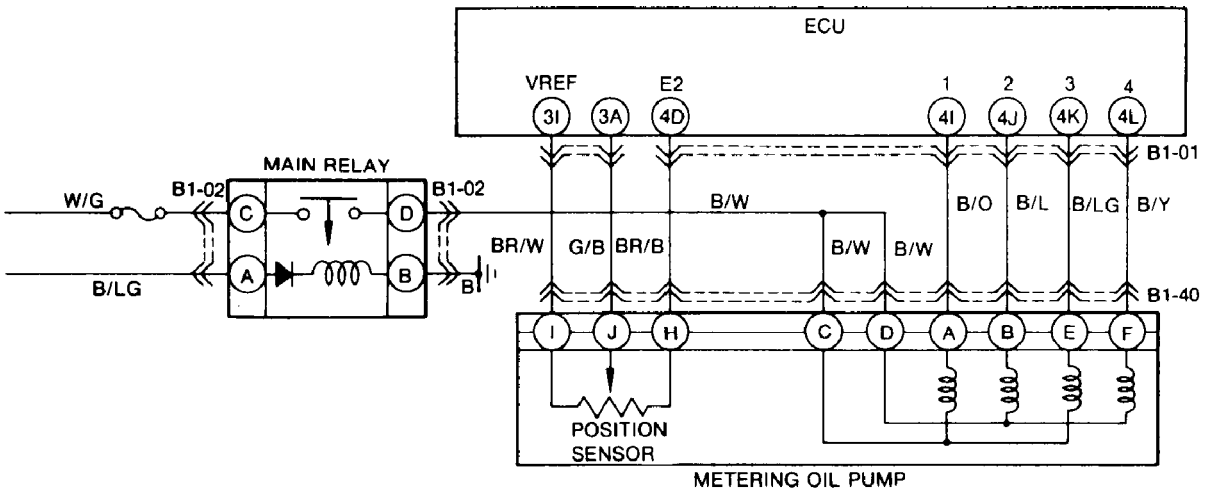
Fig. 36: Trouble Code No. 25 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 26 (METERING OIL PUMP STEPPER MOTOR)

TROUBLE CODE NO. 26 (METERING OIL PUMP STEPPER MOTOR)

STEP	INSPECTION		ACTION
1	Are there any poor conections at metering oil pump and ECU connector?	Yes	Repair or replace connector
		No	Go to next step
2	Is resistance of MOP stepping motor OK? Resistance: terminal / kΩ C – SM1 A / 16–31 C – SM3 E D – SM2 B D – SM4 F	Yes	Go to next step
		No	Replace MOP
3	Is continuity between MOP stepping motor and ECU terminals OK? MOP terminal / ECU terminal SM1 A / 4I (B/O) SM2 B / 4J (B/L) SM3 E / 4K (B/LG) SM4 F / 4L (B/Y)	Yes	Repair wiring harness (MOP-Main relay)
		No	Repair wiring harness (MOP-ECU terminals)
4	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU
		No	Intermittent poor connection check for cause

93G80636
Fig. 37: Trouble Code No. 26 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93B80631
Fig. 38: Trouble Code No. 26 - Schematic
Courtesy Of Mazda Motors Corp.

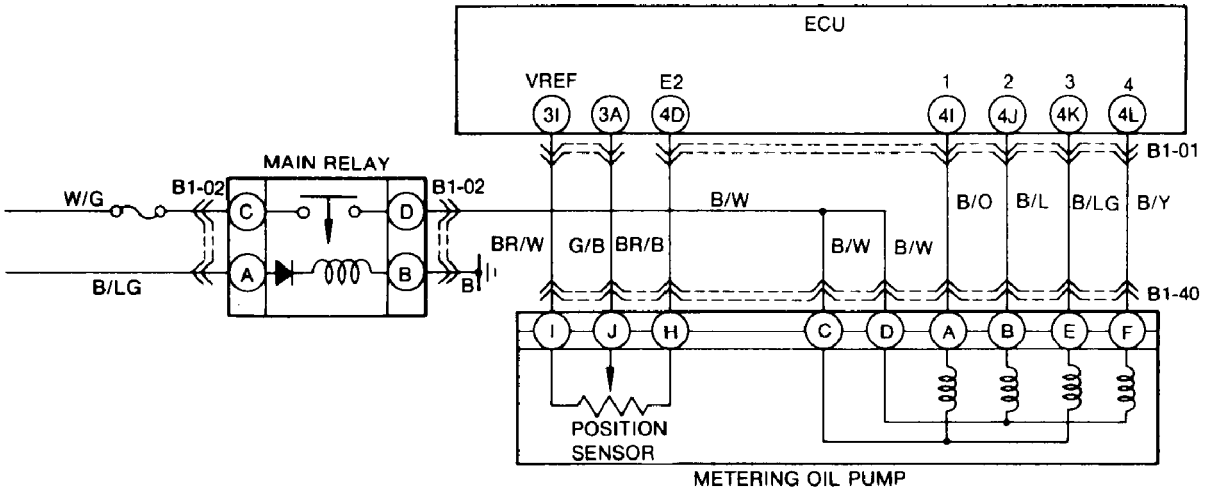
TROUBLE CODE NO. 27 (METERING OIL PUMP)

TROUBLE CODE NO. 27 (METERING OIL PUMP)

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>1</td><td>Are there any poor conections at metering oil pump and ECU connector?</td><td>Yes</td><td>Repair or replace connector</td></tr>
<tr><td></td><td></td><td>No</td><td>Go to next step</td></tr>
<tr><td>2</td><td>Is ECU terminal 3A voltage OK?
<table><tr><th>Condition</th><th>Voltage</th></tr><tr><td>Idle</td><td>1.1V</td></tr><tr><td>Acceleration</td><td>1.0V–4.2V</td></tr></table></td><td>Yes</td><td>Go to step 4</td></tr>
<tr><td></td><td></td><td>No</td><td>Go to next step</td></tr>
<tr><td>3</td><td>Is resistance of MOP position sensor OK?
Resistance: J–H 0.4–12 kΩ
J–I 10–2 kΩ
H–I 0.4–12 kΩ</td><td>Yes</td><td>Go to next step</td></tr>
<tr><td></td><td></td><td>No</td><td>Replace MOP</td></tr>
<tr><td>4</td><td>Is ECU terminals voltage OK?
Specification: (Idle)
<table><tr><th>Stepping Motor</th><th>ECU terminal</th><th>Output voltage</th></tr><tr><td>SM1 A</td><td>4I (B/O)</td><td rowspan="2">One terminal:
12V</td></tr><tr><td>SM2 B</td><td>4J (B/L)</td></tr><tr><td>SM3 E</td><td>4K (B/LG)</td><td rowspan="2">Three terminals:
5–9 V</td></tr><tr><td>SM4 F</td><td>4L (B/Y)</td></tr></table></td><td>Yes</td><td>Go to step 7</td></tr>
<tr><td></td><td></td><td>No</td><td>Go to next step</td></tr>
<tr><td>5</td><td>Is resistance of MOP stepping motor OK?
Resistance:
<table><tr><th>terminal</th><th>kΩ</th></tr><tr><td>C – SM1 A</td><td rowspan="4">16–31</td></tr><tr><td>C – SM3 E</td></tr><tr><td>D – SM2 B</td></tr><tr><td>D – SM4 F</td></tr></table></td><td>Yes</td><td>Go to next step</td></tr>
<tr><td></td><td></td><td>No</td><td>Replace MOP</td></tr>
<tr><td>6</td><td>Is continuity between MOP stepping motor and ECU terminals OK?
<table><tr><th>MOP terminal</th><th>ECU terminal</th></tr><tr><td>SM1 A</td><td>4I (B/O)</td></tr><tr><td>SM2 B</td><td>4J (B/L)</td></tr><tr><td>SM3 E</td><td>4K (B/LG)</td></tr><tr><td>SM4 F</td><td>4L (B/Y)</td></tr></table></td><td>Yes</td><td>Repair wiring harness (MOP-Main relay)</td></tr>
<tr><td></td><td></td><td>No</td><td>Repair wiring harness (MOP-ECU terminals)</td></tr>
<tr><td>7</td><td>Disconnect negative battery cable for at least 20 seconds
Connect battery cable and recheck for service code
Is service code displayed?</td><td>Yes</td><td>Replace ECU</td></tr>
<tr><td></td><td></td><td>No</td><td>Intermittent poor connection
check for cause</td></tr>
</table>

93H80637

Fig. 39: Trouble Code No. 27 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93B80631

Fig. 40: Trouble Code No. 27 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 28 (SOLENOID VALVE - EGR)

TROUBLE CODE NO. 28 (SOLENOID VALVE – EGR)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/Y) and ECU terminal 4O?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/Y]–ECU terminal 4O) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93I80638

Fig. 41: Trouble Code No. 28 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.

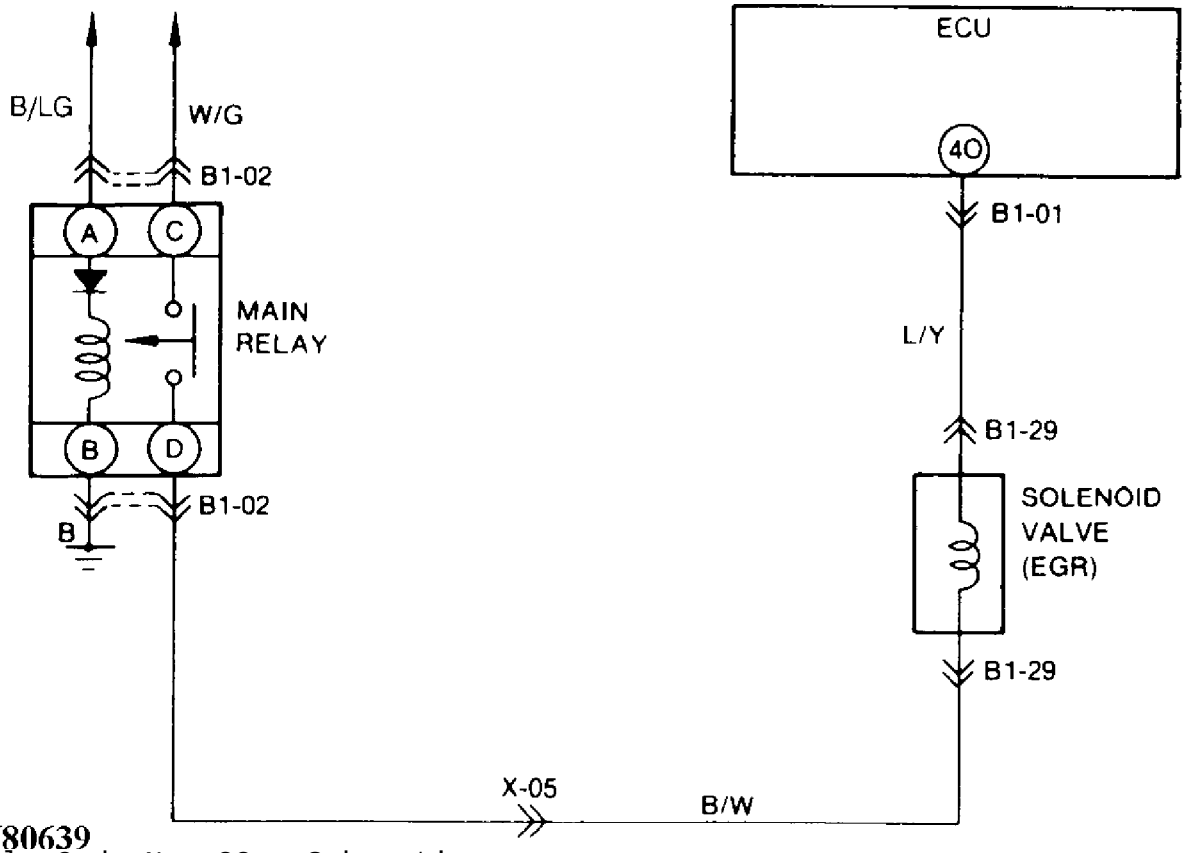


Fig. 42: Trouble Code No. 28 - Schematic
Courtesy Of Mazda Motors Corp.

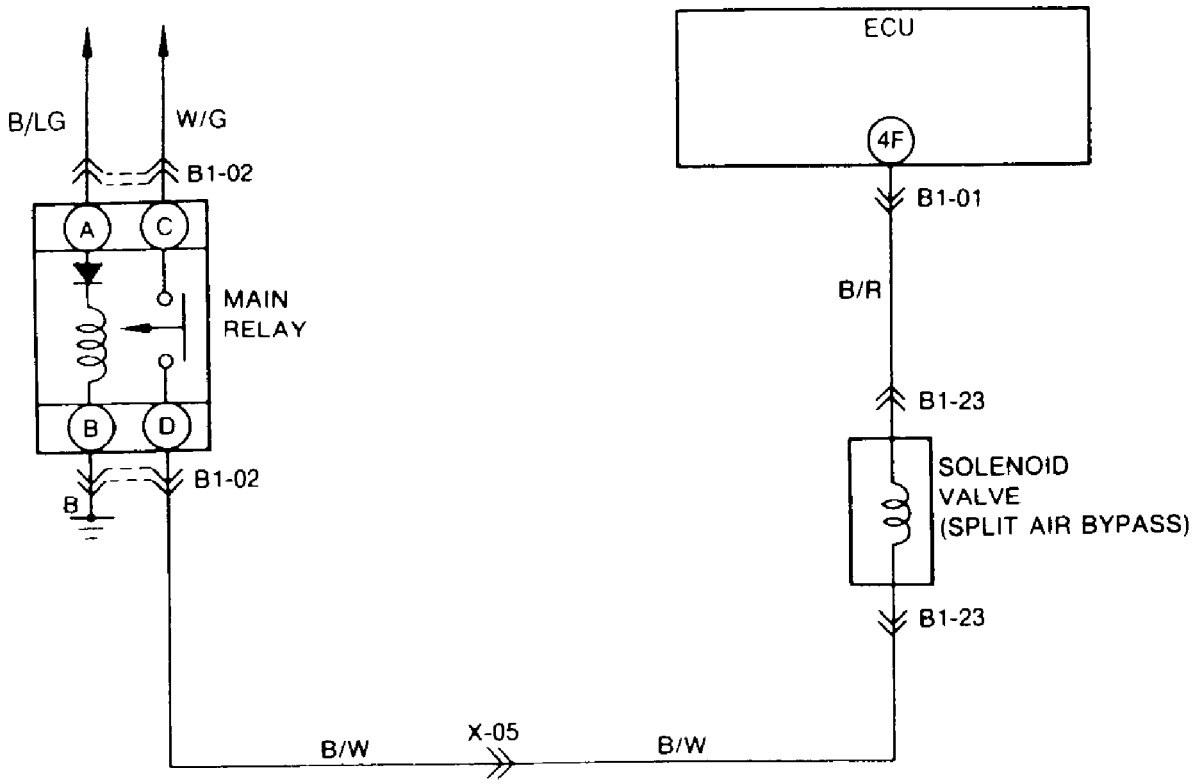
TROUBLE CODE NO. 30 (SOLENOID VALVE - SPLIT AIR BY-PASS)

TROUBLE CODE NO. 30 (SOLENOID VALVE – SPLIT AIR BY-PASS)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON; Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (B/R) and ECU terminal 4F?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [B/R]–ECU terminal 4F) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93C80640

Fig. 43: Trouble Code No. 30 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93D80641

Fig. 44: Trouble Code No. 30 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 31 (SOLENOID VALVE - RELIEF 1)

TROUBLE CODE NO. 31 (SOLENOID VALVE – RELIEF 1)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON; Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (Y/R) and ECU terminal 3P?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [Y/R]–ECU terminal 3P) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93E80642

Fig. 45: Trouble Code No. 31 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.

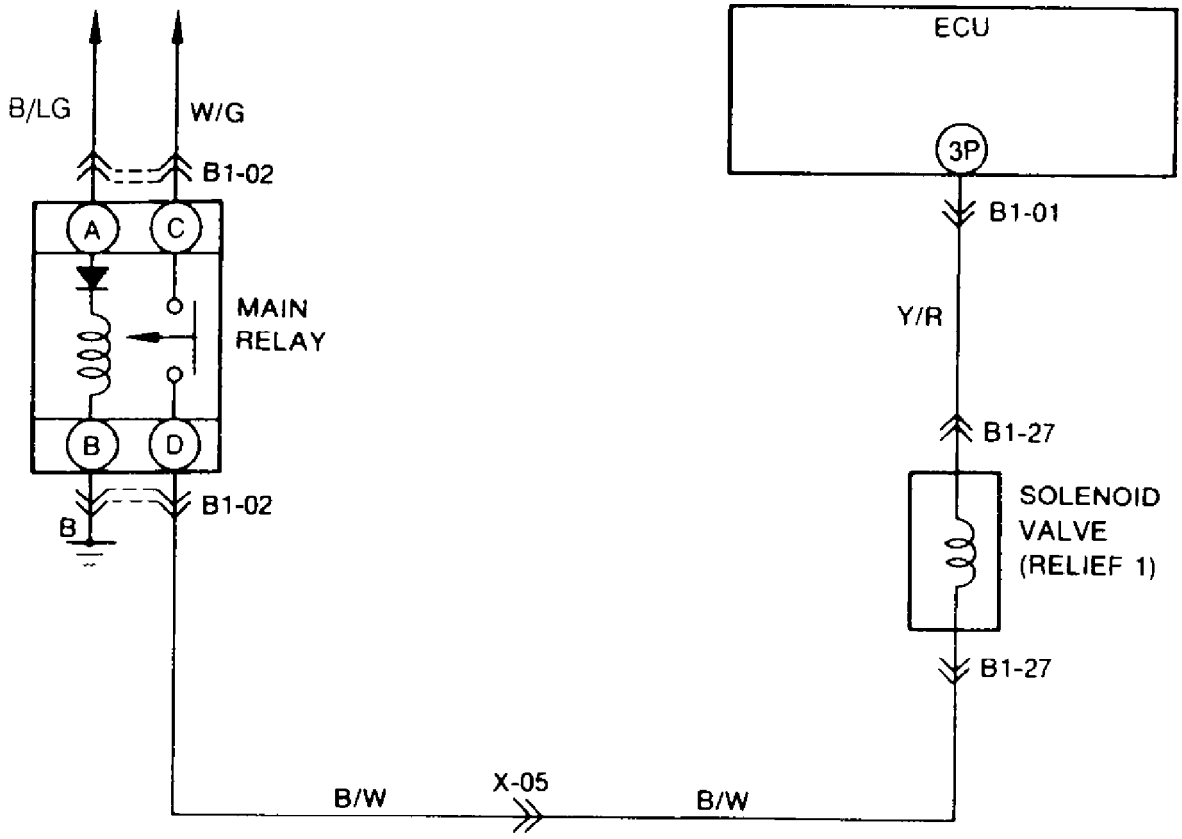


Fig. 46: Trouble Code No. 31 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 32 (SOLENOID VALVE - SWITCHING)

TROUBLE CODE NO. 32 (SOLENOID VALVE – SWITCHING)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/R) and ECU terminal 4N?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/R] ECU terminal 4N) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93G80644

Fig. 47: Trouble Code No. 32 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.

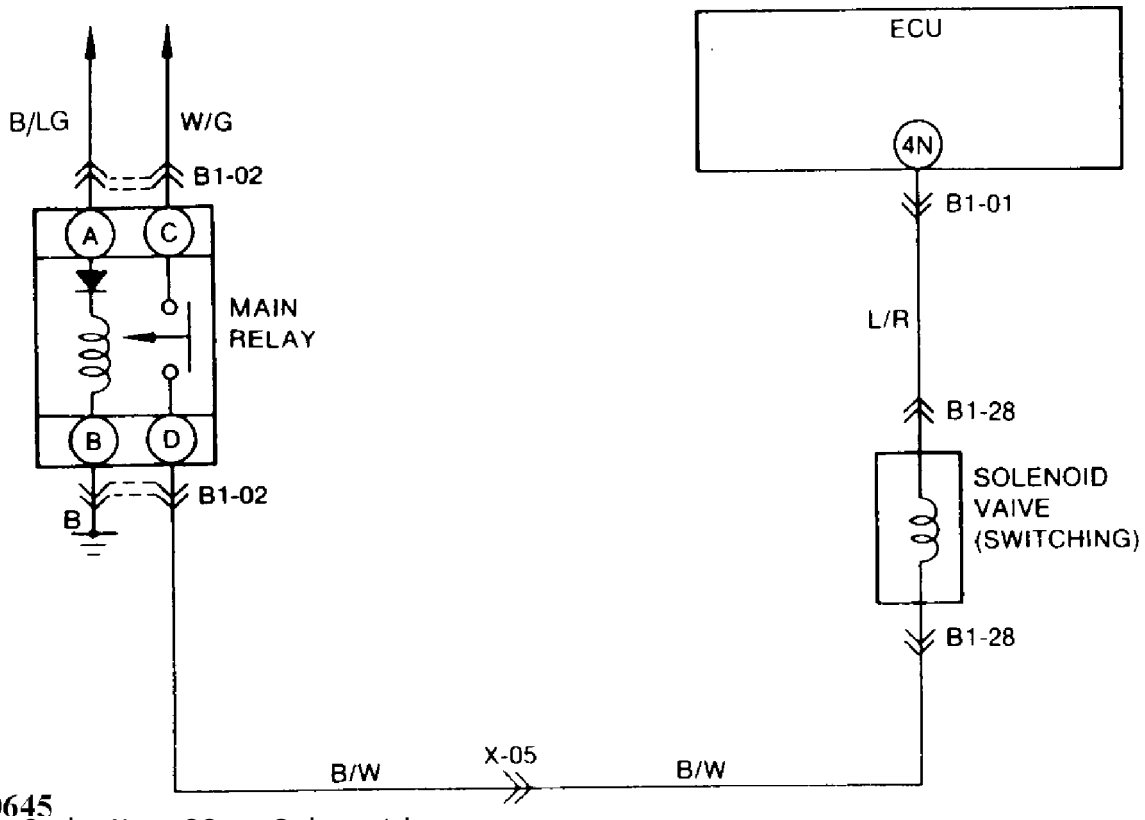


Fig. 48: Trouble Code No. 32 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 33 (SOLENOID VALVE - PORT AIR BY-PASS)

TROUBLE CODE NO. 33 (SOLENOID VALVE – PORT AIR BY-PASS)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L) and ECU terminal 3N?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L]–ECU terminal 3N) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93I80646

Fig. 49: Trouble Code No. 33 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.

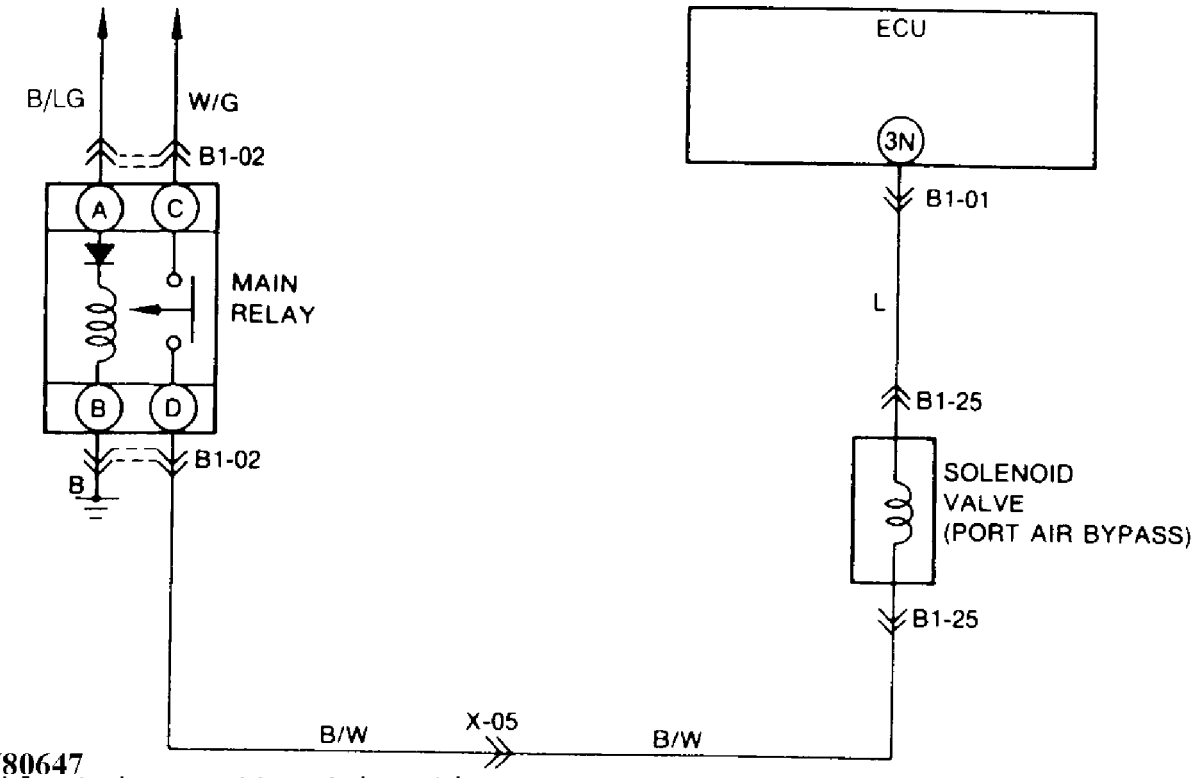


Fig. 50: Trouble Code No. 33 - Schematic
Courtesy Of Mazda Motors Corp.

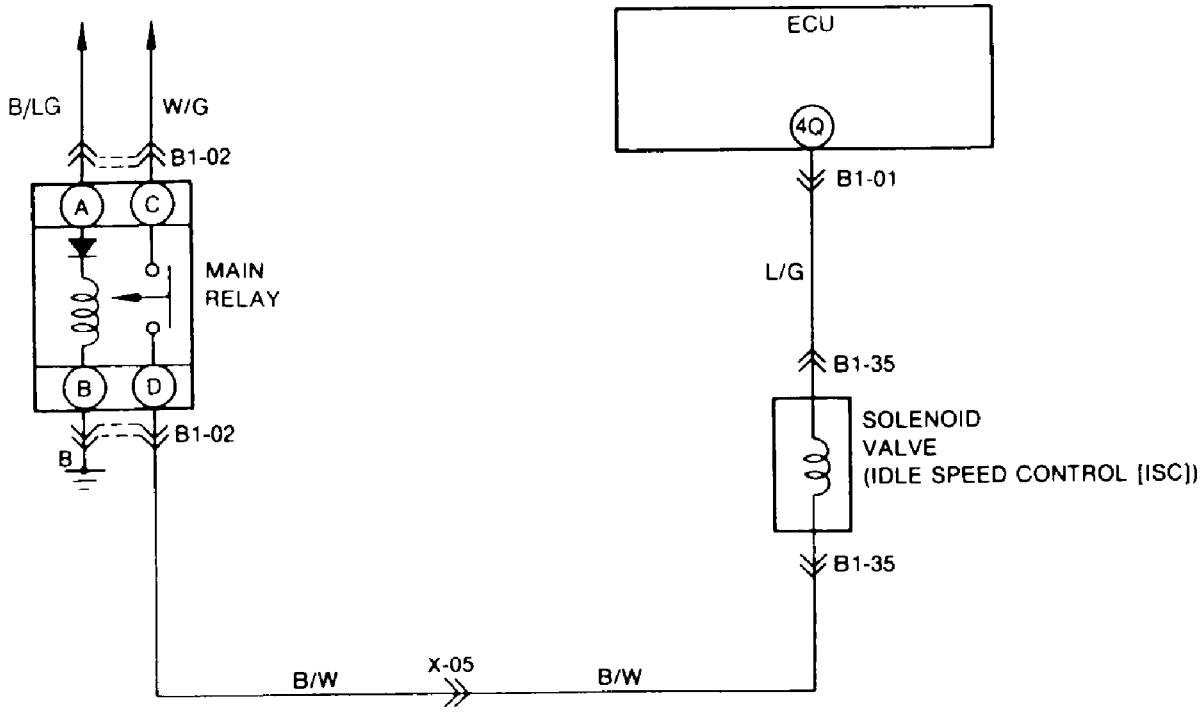
TROUBLE CODE NO. 34 (SOLENOID VALVE - IDLE SPEED CONTROL)

TROUBLE CODE NO. 34 (SOLENOID VALVE – IDLE SPEED CONTROL)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON; Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/G) and ECU terminal 4Q?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/G]–ECU terminal 4Q) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93A80648

Fig. 51: Trouble Code No. 34 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



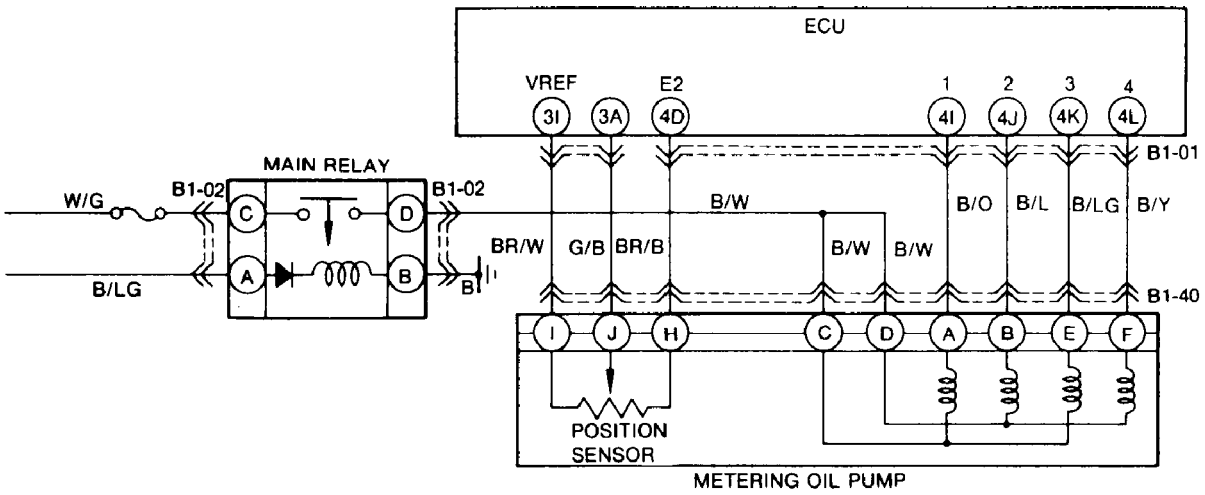
93B80649
Fig. 52: Trouble Code No. 34 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 37 (METERING OIL PUMP)

TROUBLE CODE NO. 37 (METERING OIL PUMP)

STEP	INSPECTION		ACTION
1	Is battery voltage OK? **Specification: 12–14V (at idle)**	Yes	Go to next step
		No	Repair charging system and/or Battery
2	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU
		No	Intermittent poor connection Check for cause

93F80650
Fig. 53: Trouble Code No. 37 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93B80631
Fig. 54: Trouble Code No. 37 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 38 (SOLENOID VALVE - ACCELERATED WARM-UP SYSTEM - AWS)

TROUBLE CODE NO. 38 (SOLENOID VALVE – ACCELERATED WARM-UP SYSTEM – AWS

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON; Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (BR/Y) and ECU terminal 4P?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [BR/Y]–ECU terminal 4P) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93G80651
Fig. 55: Trouble Code No. 38 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.

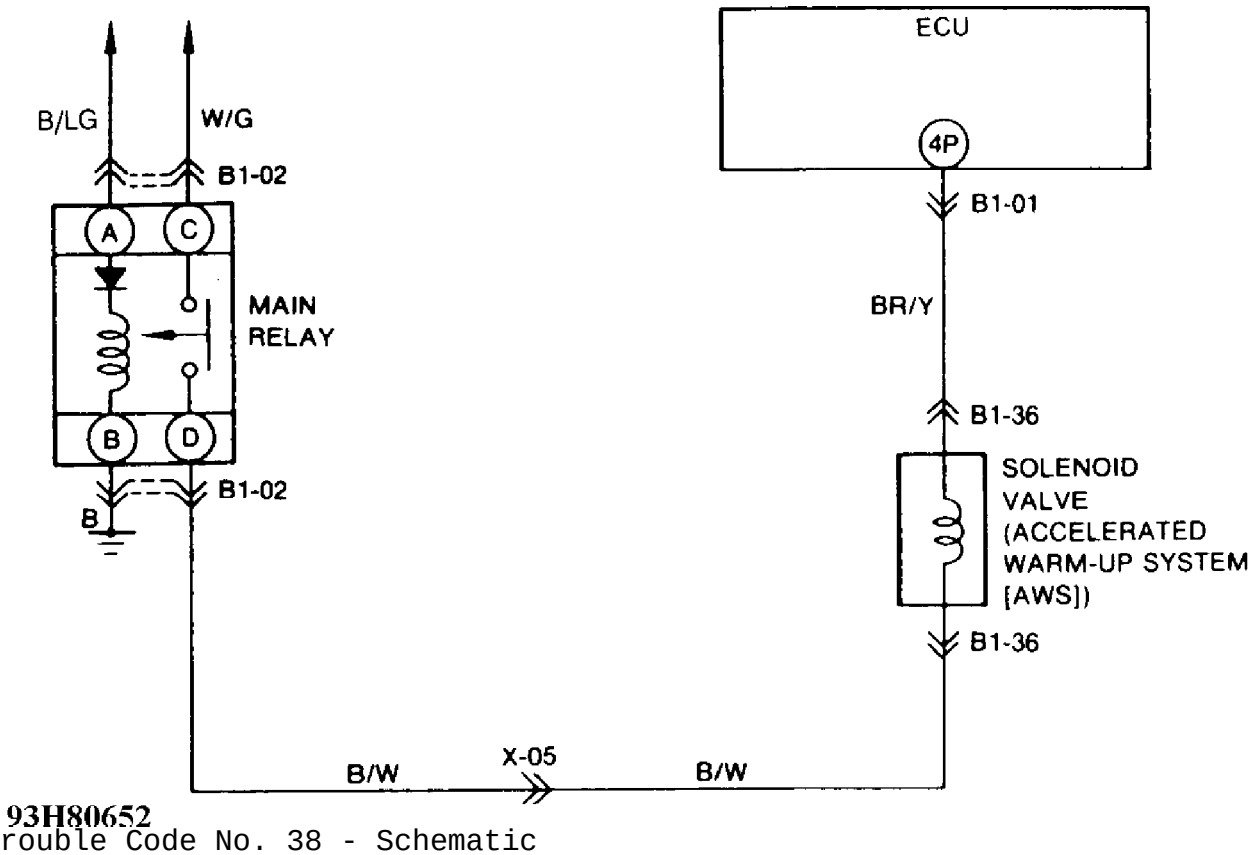


Fig. 56: Trouble Code No. 38 - Schematic
Courtesy Of Mazda Motors Corp.

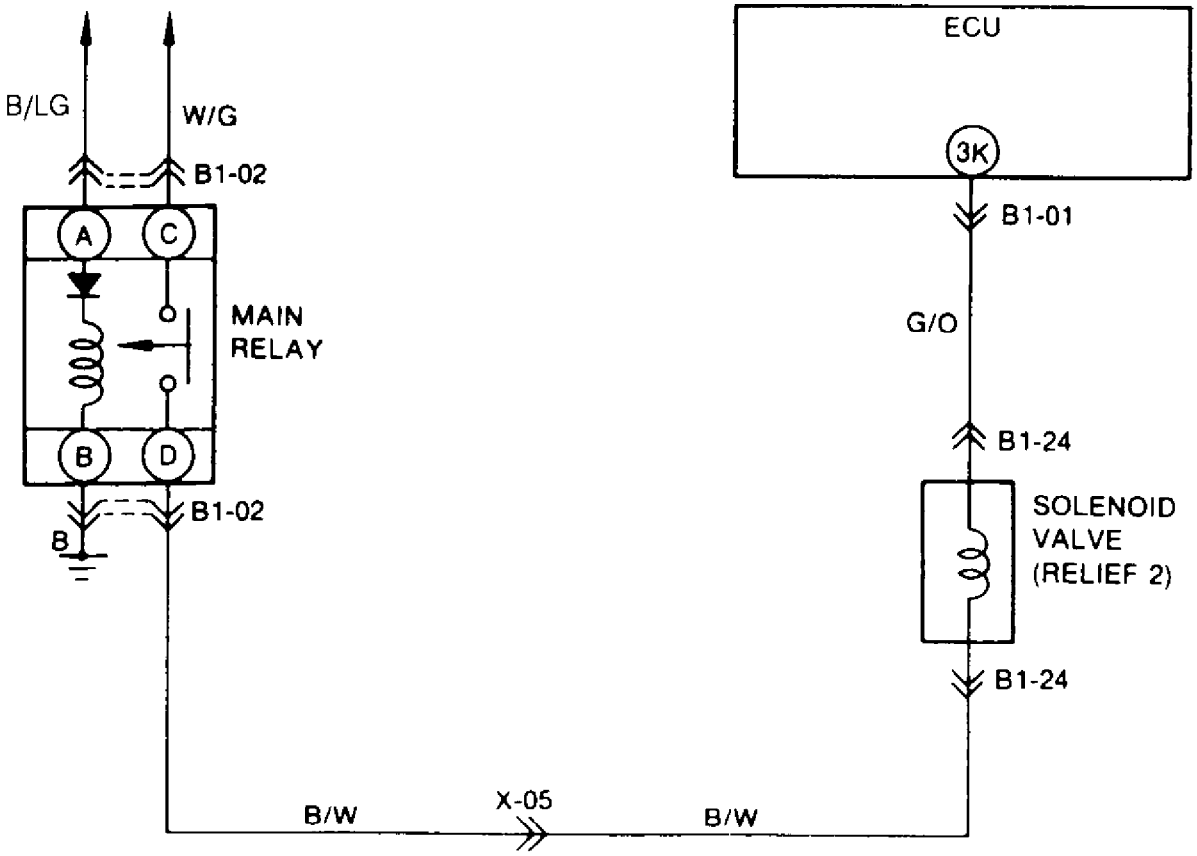
TROUBLE CODE NO. 39 (SOLENOID VALVE - RELIEF 2)

TROUBLE CODE NO. 39 (SOLENOID VALVE – RELIEF 2)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (G/O) and ECU terminal 3K?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [G/O]–ECU terminal 3K) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93I80653

Fig. 57: Trouble Code No. 39 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93J80654

Fig. 58: Trouble Code No. 39 - Schematic
Courtesy Of Mazda Motors Corp.

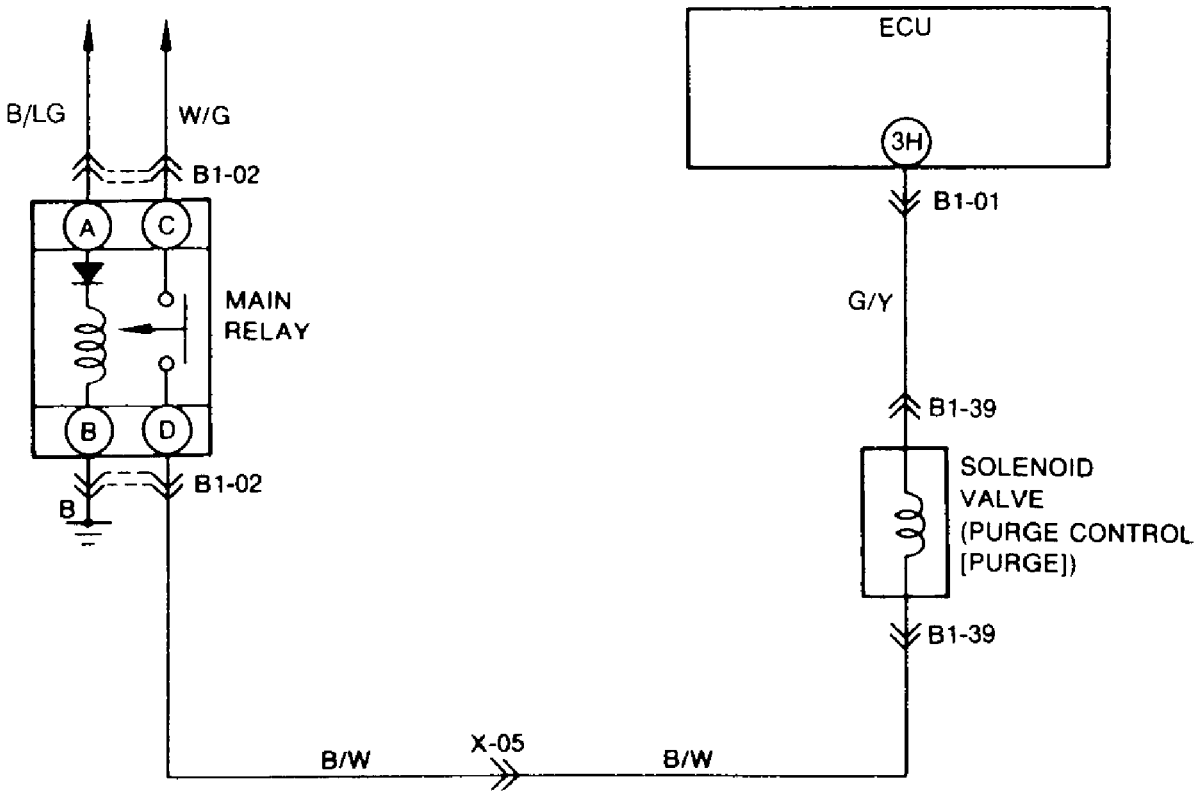
TROUBLE CODE NO. 40 (SOLENOID VALVE - PURGE CONTROL)

TROUBLE CODE NO. 40 (SOLENOID VALVE – PURGE CONTROL)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (G/Y) and ECU terminal 3H?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [G/Y]–ECU terminal 3H) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93A80655

Fig. 59: Trouble Code No. 40 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93B80656

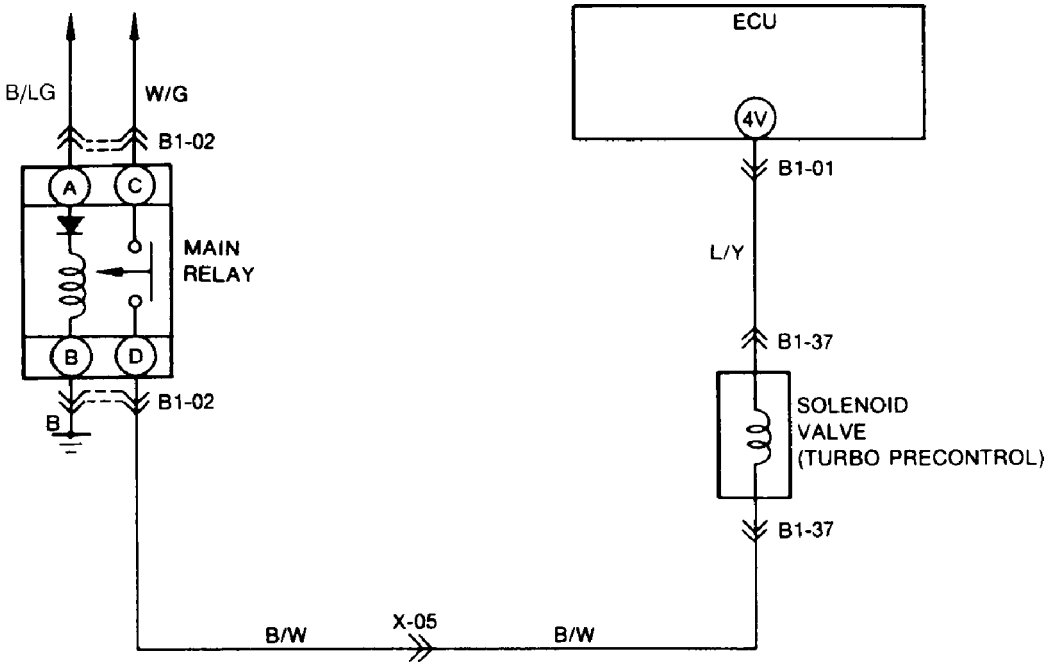
Fig. 60: Trouble Code No. 40 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 42 (SOLENOID VALVE - TURBO PRE-CONTROL)

TROUBLE CODE NO. 42 (SOLENOID VALVE – TURBO PRE-CONTROL)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/Y) and ECU terminal 4V?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/Y]–ECU terminal 4V) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93C80657
Fig. 61: Trouble Code No. 42 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93D80658
Fig. 62: Trouble Code No. 42 - Schematic
Courtesy Of Mazda Motors Corp.

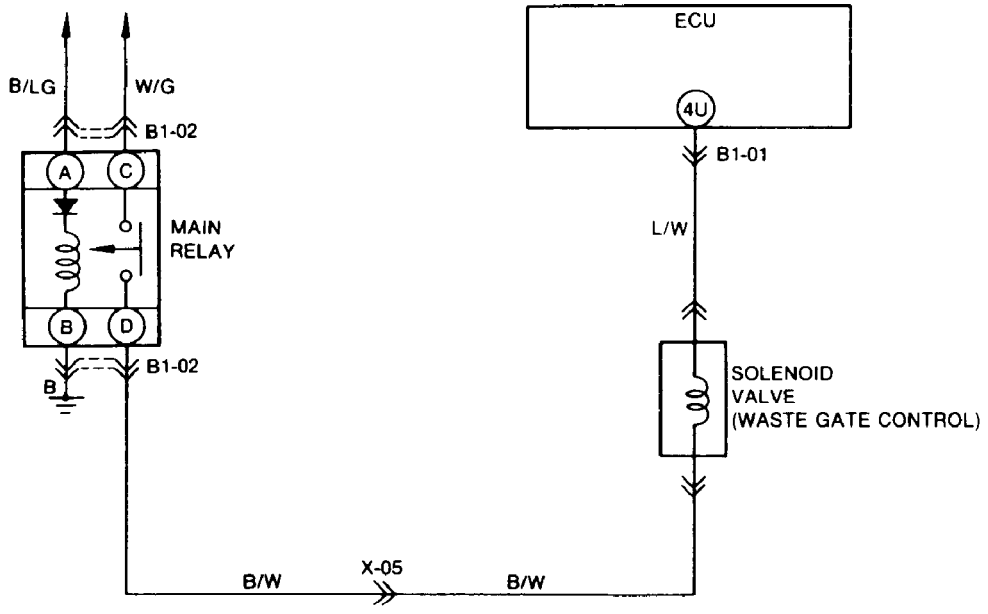
TROUBLE CODE NO. 43 (SOLENOID VALVE - WASTEGATE CONTROL)

TROUBLE CODE NO. 43 (SOLENOID VALVE – WASTEGATE CONTROL)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/W) and ECU terminal 4U?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/W]–ECU terminal 4U) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93E80659

Fig. 63: Trouble Code No. 43 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93H80660

Fig. 64: Trouble Code No. 43 - Schematic
Courtesy Of Mazda Motors Corp.

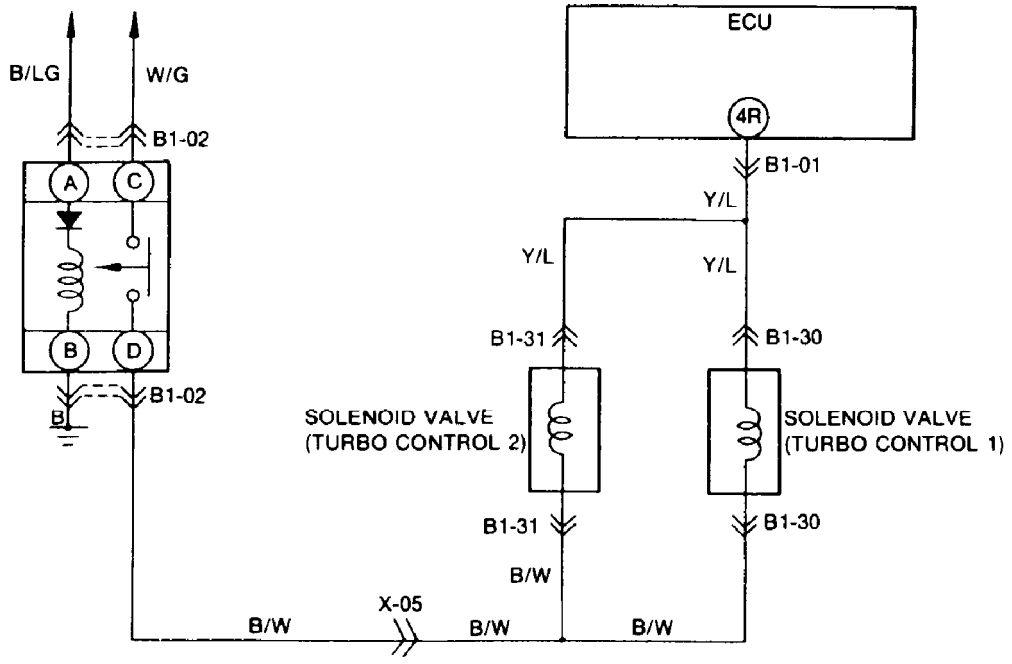
TROUBLE CODE NO. 44 (SOLENOID VALVE - TURBO CONTROL)

TROUBLE CODE NO. 44 (SOLENOID VALVE – TURBO CONTROL)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON; Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (Y/L) and ECU terminal 4R?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [Y/L]–ECU terminal 4R) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93I80661

Fig. 65: Trouble Code No. 44 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93J80662

Fig. 66: Trouble Code No. 44 - Schematic
Courtesy Of Mazda Motors Corp.

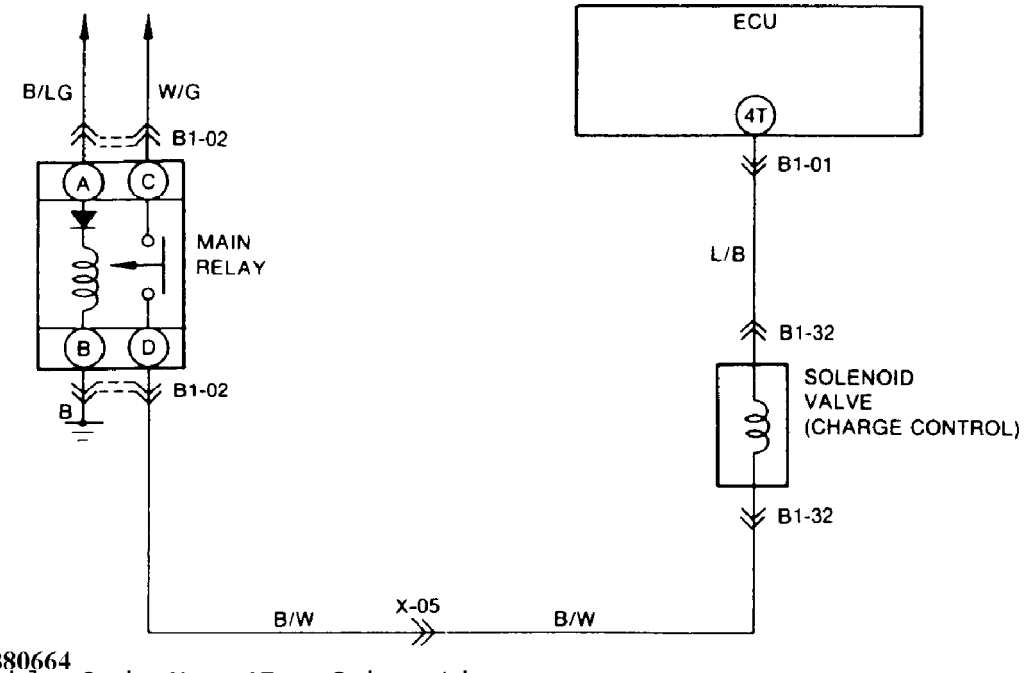
TROUBLE CODE NO. 45 (SOLENOID VALVE - CHARGE CONTROL)

TROUBLE CODE NO. 45 (SOLENOID VALVE – CHARGE CONTROL)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON; Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/B) and ECU terminal 4T?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/B]–ECU terminal 4T) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93A80663

Fig. 67: Trouble Code No. 45 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93B80664

Fig. 68: Trouble Code No. 45 - Schematic
Courtesy Of Mazda Motors Corp.

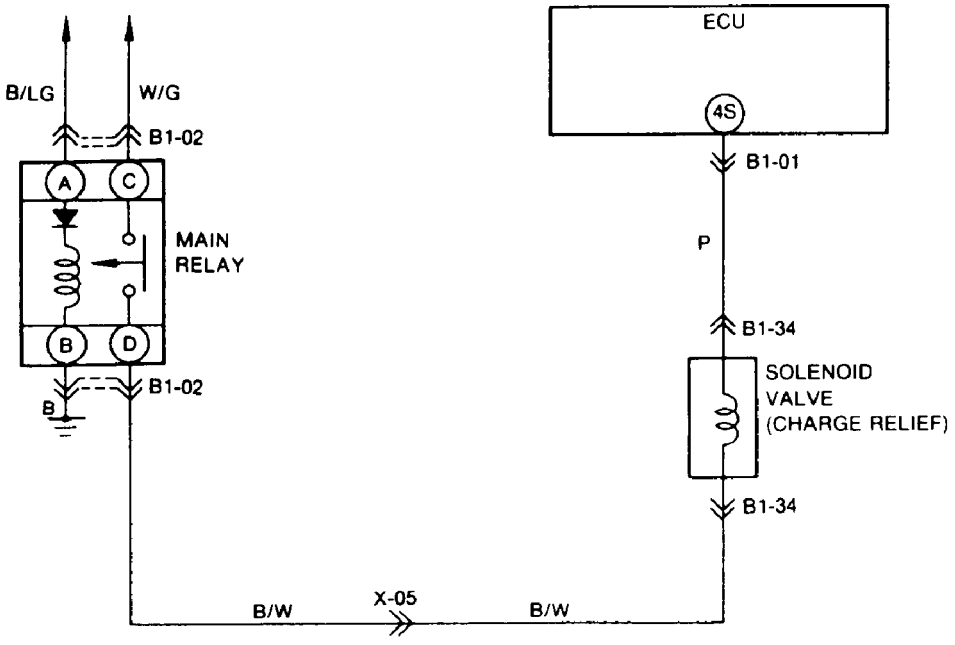
TROUBLE CODE NO. 46 (SOLENOID VALVE - CHARGE RELIEF CONTROL)

TROUBLE CODE NO. 46 (SOLENOID VALVE – CHARGE RELIEF CONTROL)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (B/R) and ECU terminal 4S?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [B/R]–ECU terminal 4S) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93C80665

Fig. 69: Trouble Code No. 46 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93D80666

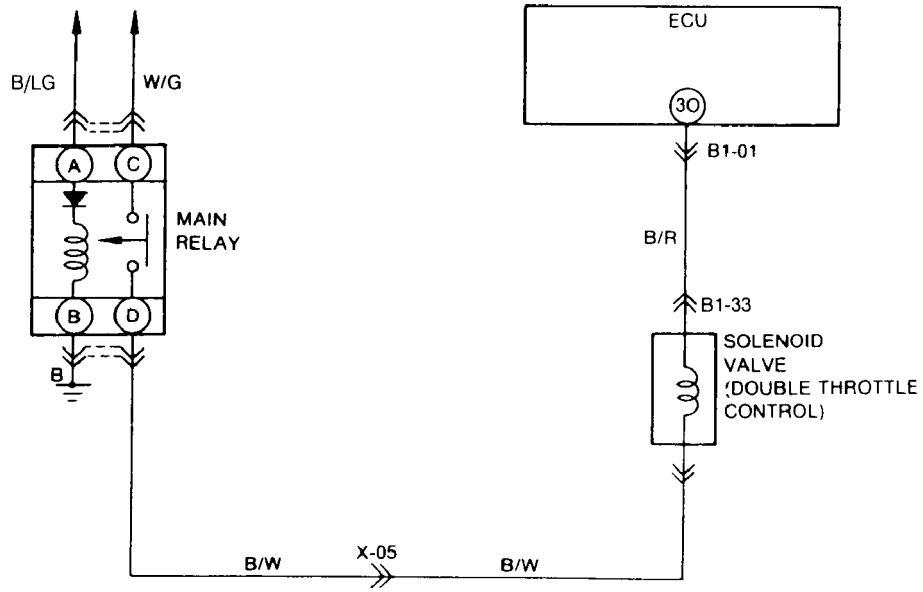
Fig. 70: Trouble Code No. 46 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 50 (SOLENOID VALVE - DOUBLE THROTTLE CONTROL)

TROUBLE CODE NO. 50 (SOLENOID VALVE – DOUBLE THROTTLE CONTROL)

STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (B/R) and ECU terminal 3O?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [B/R]–ECU terminal 3O) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK?	Yes	Replace ECU
		No	Replace solenoid valve

93E80667
Fig. 71: Trouble Code No. 50 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



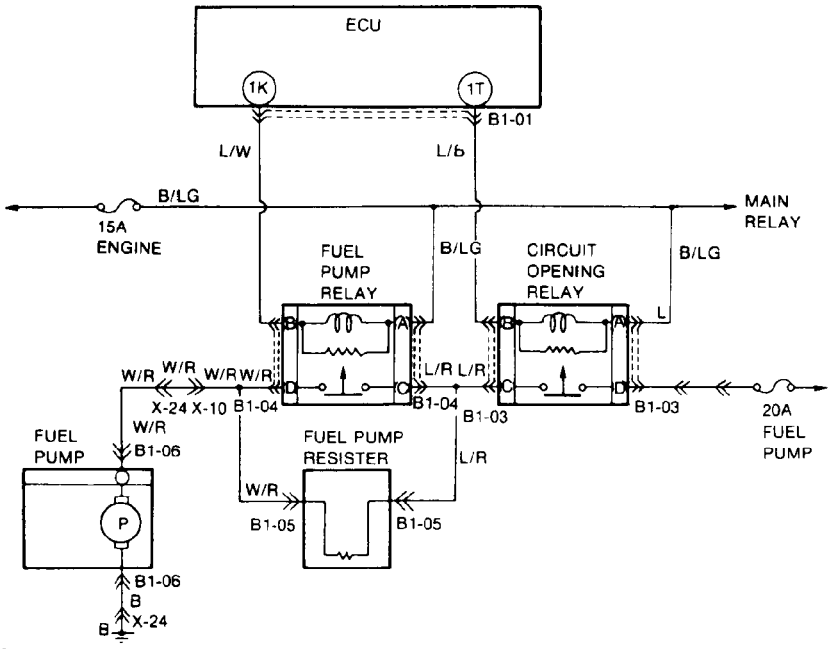
93F80668
Fig. 72: Trouble Code No. 50 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 51 (FUEL PUMP RELAY)

TROUBLE CODE NO. 51 (FUEL PUMP RELAY)

STEP	INSPECTION		ACTION
1	Does fuel pump relay circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/LG) voltage OK with fuel pump relay connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Fuel pump relay terminal [B/LG]–Main relay terminal [B/LG])
3	Is there continuity between fuel pump relay terminal (L/W) and ECU terminal 1K?	Yes	Check for short circuit in wiring harness (Fuel pump relay terminal [L/W]–ECU terminal 1K) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is fuel pump relay OK?	Yes	Replace ECU
		No	Replace fuel pump relay

93G80669
Fig. 73: Trouble Code No. 51 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93J80670
Fig. 74: Trouble Code No. 51 - Schematic
Courtesy Of Mazda Motors Corp.

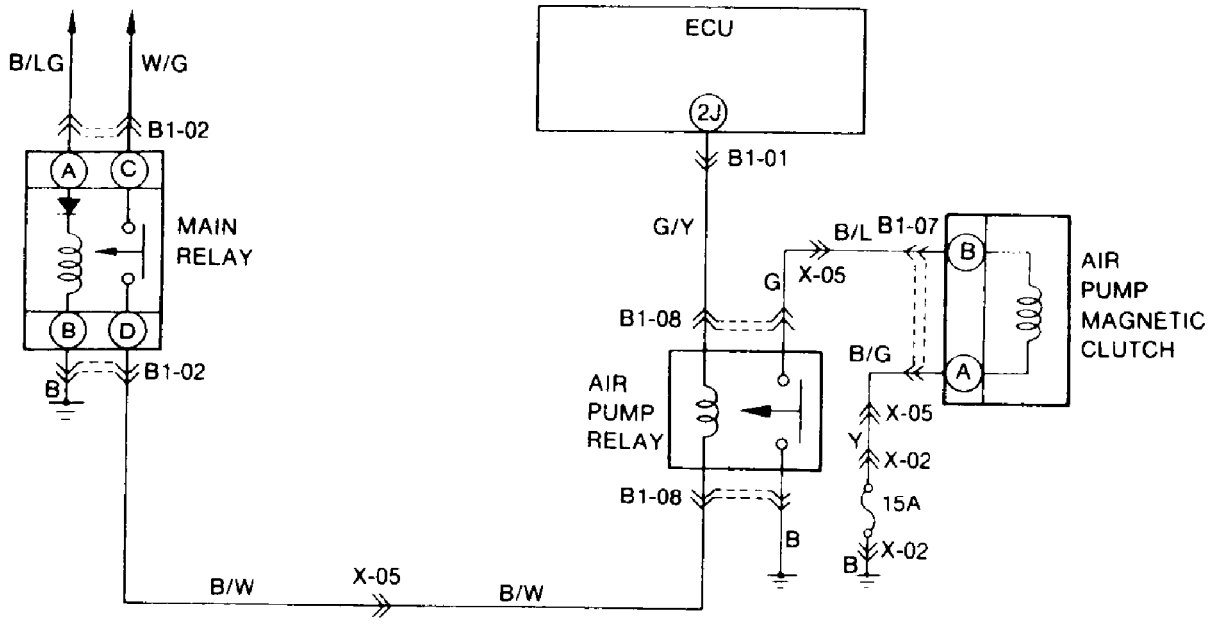
TROUBLE CODE NO. 54 (AIR PUMP RELAY)

TROUBLE CODE NO. 54 (AIR PUMP RELAY)

STEP	INSPECTION		ACTION
1	Does air pump relay circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with airpump relay connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (airpump relay [B/W]–Main relay terminal [B/W])
3	Is there continuity between airpump relay terminal (G/Y) and ECU terminal 2J?	Yes	Check for short circuit in wiring harness (Airpump relay [G/Y]–ECU terminal 2J) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is air pump relay OK?	Yes	Replace ECU
		No	Replace air pump relay

93A80671

Fig. 75: Trouble Code No. 54 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93B80672

Fig. 76: Trouble Code No. 54 - Schematic
Courtesy Of Mazda Motors Corp.

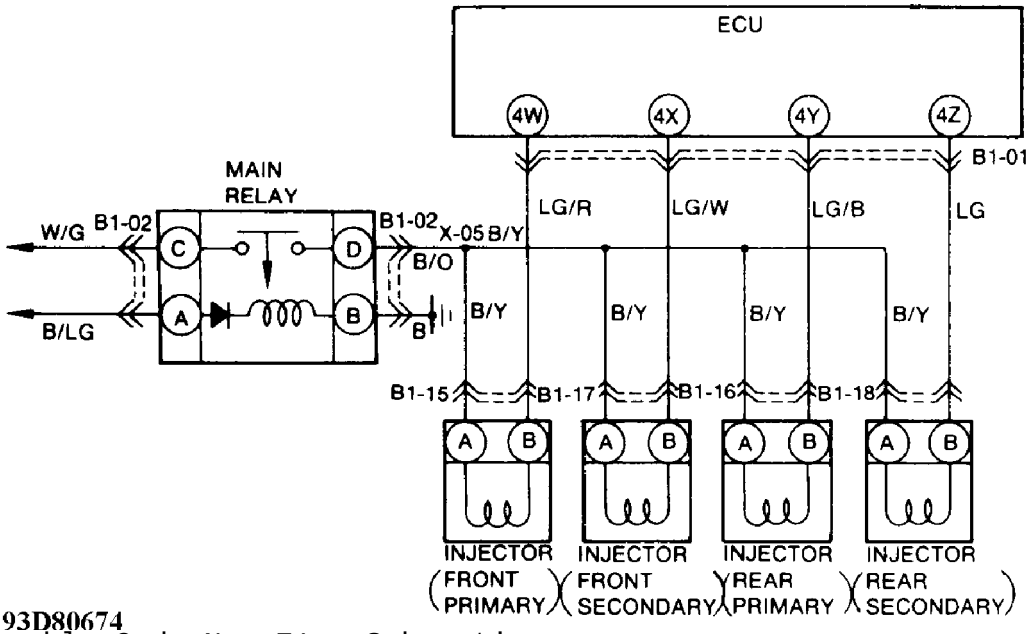
TROUBLE CODE NO. 71 (INJECTOR - FRONT SECONDARY)

TROUBLE CODE NO. 71 (INJECTOR – FRONT SECONDARY)

STEP	INSPECTION		ACTION
1	Does injector circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/Y) voltage OK with injector connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (injector terminal 4X [B/Y]–Main relay terminal [B/O])
3	Is injector resistance OK? **Resistance: 13.5 Ω (20°C [68°F])**	Yes	Go to next step
		No	Replace injector
4	Is there continuity between injector terminal and ECU terminal? INJECTOR: Front (LG/W) — ECU: 4X	Yes	Check for short circuit in wiring harness Injector to ECU ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
5	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU
		No	Intermittent poor connection Check for cause

93C80673

Fig. 77: Trouble Code No. 71 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93D80674

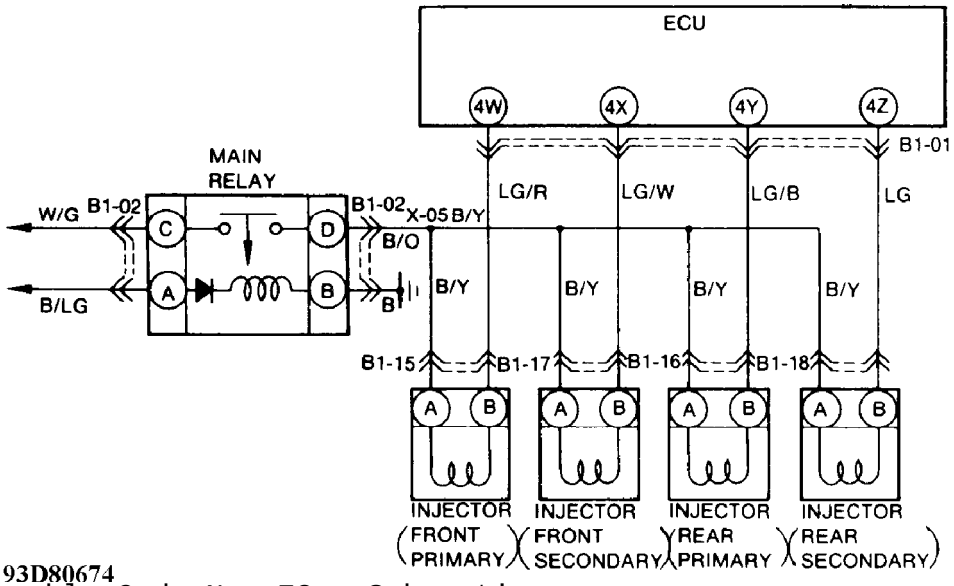
Fig. 78: Trouble Code No. 71 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 73 (INJECTOR - REAR SECONDARY)

TROUBLE CODE NO. 73 (INJECTOR – REAR SECONDARY)

STEP	INSPECTION		ACTION
1	Does injector circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/Y) voltage OK with injector connector disconnected? **Condition** / **Voltage**: Ignition switch ON / Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (injector terminal 4Z [B/Y] Main relay terminal [B/O])
3	Is injector resistance OK ? **Resistance: 13.8 Ω (20°C [68°F])**	Yes	Go to next step
		No	Replace injector
4	Is there continuity between injector terminal and ECU terminal? INJECTOR / ECU: Rear (LG) / 4Z	Yes	Check for short circuit in wiring harness Injector to ECU ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
5	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU
		No	Intermittent poor connection Check for cause

93E80675
Fig. 79: Trouble Code No. 73 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



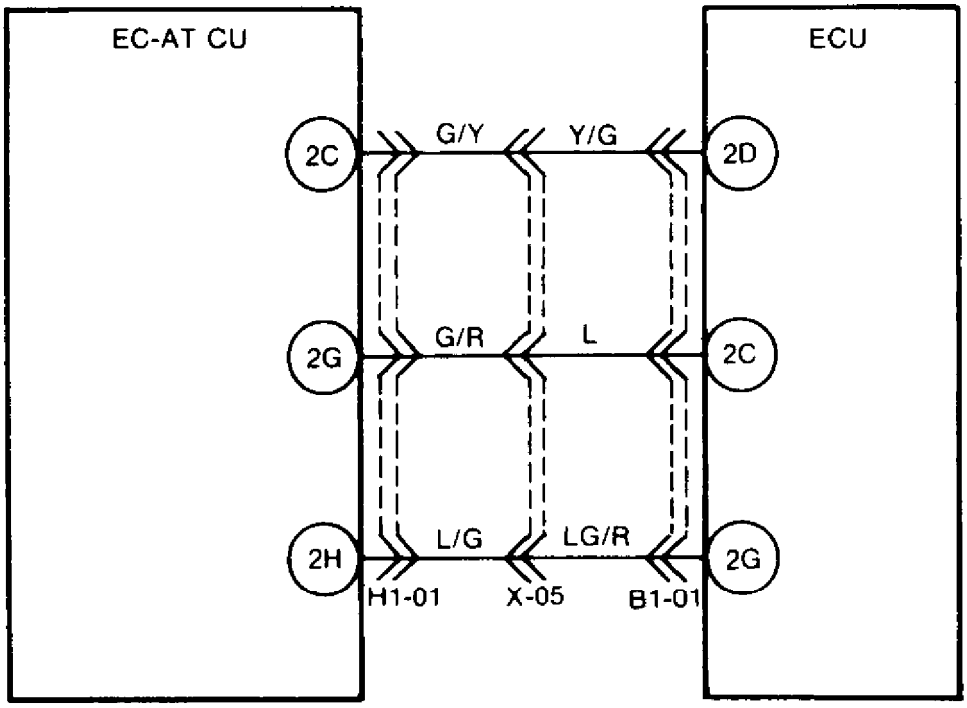
93D80674
Fig. 80: Trouble Code No. 73 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 76 (SLIP LOCK-UP OFF SIGNAL)

TROUBLE CODE NO. 76 (SLIP LOCK-UP OFF SIGNAL)

STEP	INSPECTION		ACTION
1	Is there poor connection in Lockup off signal circuit between ECU and EC-AT CU?	Yes	Repair or replace connector
		No	Go to next step
2	Is there continuity between ECU terminal 2G and EC-AT CU terminal 2H	Yes	Go to next step
		No	Check for open circuit in wiring from EC-AT CU to ECU
3	Is EC-AT CU terminal 2H voltage OK?	Yes	Go to next step
		No	Check for cause
4	Is ECU terminal 2G voltage OK?	Yes	Replace ECU
		No	Check for short circuit in wiring from EC-AT CU to ECU

93F80676
Fig. 81: Trouble Code No. 76 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



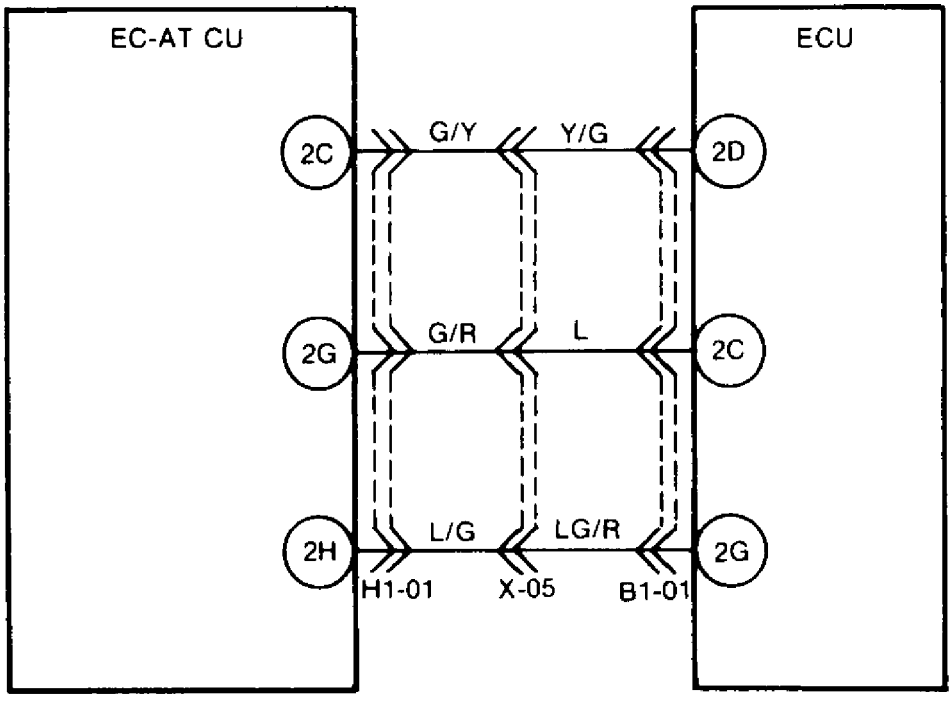
93G80677
Fig. 82: Trouble Code No. 76 - Schematic
Courtesy Of Mazda Motors Corp.

TROUBLE CODE NO. 77 (TORQUE REDUCED SIGNAL)

TROUBLE CODE NO. 77 (TORQUE REDUCED SIGNAL)

STEP	INSPECTION		ACTION
1	Is there poor connection in Torque reduced signal circuit between ECU and EC-AT CU?	Yes	Repair or replace connector
		No	Go to next step
2	Is there continuity between ECU terminal 2D and EC-AT CU terminal 2C	Yes	Go to next step
		No	Check for open circuit in wiring from EC-AT CU to ECU
3	Is EC-AT CU terminal 2C voltage OK?	Yes	Go to next step
		No	Check for cause
4	Is ECU terminal 2D voltage OK?	Yes	Replace ECU
		No	Check for short circuit in wiring from EC-AT CU to ECU

93H80678
Fig. 83: Trouble Code No. 77 - Diagnostic Flowchart
Courtesy Of Mazda Motors Corp.



93G80677
Fig. 84: Trouble Code No. 77 - Schematic
Courtesy Of Mazda Motors Corp.

G - TESTS W/CODES
Article Text (p. 49)
1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 06:40AM

SUMMARY

If no hard fault codes (or only pass codes) are present, driveability symptoms exist or intermittent codes exist, proceed to H - TESTS W/O CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.) or intermittent diagnostic procedures.

END OF ARTICLE

H - TESTS W/O CODES
Article Text
1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 06:41AM

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Trouble Shooting - No Codes

B2200, B2600i, Miata, MPV, MX-3, MX-6,
Navajo, Protege, RX7, 323, 626, 929

INTRODUCTION

Before diagnosing symptoms or intermittent faults, perform steps in F - BASIC TESTING article and appropriate G - TESTS W/CODES article. Use this article to diagnose driveability problems existing when a hard fault code is not present or vehicle is not equipped with a self-diagnostic system.

NOTE: Some driveability problems may have been corrected by manufacturer with a revised computer calibration chip or computer control unit. Check with manufacturer for latest chip or computer application.

Symptom checks can direct the technician to malfunctioning components for further diagnosis. A symptom should lead to a specific component, system test or adjustment.

Use intermittent test procedures to locate driveability problems that do not occur when the vehicle is being tested. These test procedures should also be used if a soft (intermittent) trouble code was present but no problem was found during self-diagnostic testing.

NOTE: For specific testing procedures, see appropriate information I - SYSTEM/COMPONENT TESTS article. For specifications, see appropriate article listed below:

D - ADJUSTMENTS
C - SPECIFICATIONS

SYMPTOMS

SYMPTOM DIAGNOSIS

Symptom checks cannot be used properly unless problem occurs while vehicle is being tested. To reduce diagnostic time, ensure steps in F - BASIC TESTING article and appropriate G - TESTS W/CODES article were performed before diagnosing a symptom. Following symptoms are available for diagnosis:

* Difficult To Start Or Will Not Start
* Rough Or Unstable Idle
* High Idle After Warm Up
* Engine Stalls

* Engine Misfires Or Has Lack Of Power
* Engine Runs Rough On Deceleration
* Backfire In Exhaust System
* Poor Fuel Mileage
* Excessive Oil Consumption
* Abnormal Noise Or Knocking

DIFFICULT TO START OR WILL NOT START

Carbureted Models (B2200 Federal)

* Check battery condition.
* Ensure sufficient secondary spark is available.
* Verify choke valve is closed (engine cold).
* Verify choke valve is open (engine hot).
* Ensure fuel level is at specified mark on carburetor sight glass.
* Check mixture control valve operation.
* Check for vacuum leaks.
* Check for correct vacuum hose routing.
* Check slow fuel-cut solenoid valve operation. A click should be heard from solenoid valve as ignition is cycled on and off.
* Check duty solenoid valve for correct switching.
* Check charcoal canister operation by clamping hose(s) shut. If problem goes away, check vacuum hose routing. If routing is correct, replace charcoal canister.
* Ensure fuel system pressure is correct.
* Ensure winter grade fuel is not used in warm climate conditions.
* Ensure exhaust system is not restricted.

Fuel Injected Models

* Check battery condition.
* Check condition of spark plugs.
* Ensure fuel system pressure is correct.
* Check Electronic Fuel Injection (EFI) main fuse located in fuse box (if equipped).
* Ensure inertia switch circuit is not open (Navajo).
* Verify crank angle sensor has correct resistance values (MX-3 1.8L, Navajo, RX-7 and 929).
* Verify optical sensor is working (Miata, Protege and 323).
* Check coolant temperature sensor resistance.
* Verify Hall-Effect sensor is working (MX-3, MX-6, 626 and 929).
* Check for leaky fuel injectors or pressure regulator causing warm-engine no start.
* Check fuel pump relay operation. A click should be heard from relay as ignition switch is cycled on and off.
* Check distributor pick-up coil resistance (if equipped).
* Ensure pressure regulator control system is okay.
* Check air intake system for restriction.
* Check EGR valve and solenoid for correct operation.

* Check for cracks and poor connections at airflow meter or throttle body.
* Check ignition coil resistance.

ROUGH OR UNSTABLE IDLE

Carbureted Models (B2200 Federal)
* Ensure no vacuum leaks exist.
* Verify vacuum hose routing is correct.
* Ensure fuel level is at specified mark on carburetor sight glass.
* Check PCV operation by clamping hose shut. If problem goes away, replace PCV valve.
* Check EGR valve condition and operation.
* Verify ignition timing is correct.
* Briefly remove each spark plug wire to determine if problem can be isolated.
* Verify mixture control solenoid operation is correct.

Fuel Injected Models
* Use stethoscope to verify fuel injector operating noise.
* Ensure fuel system pressure is correct.
* Check EGR valve condition and operation.
* Verify ignition timing is correct.
* Check PCV valve.
* Check airflow sensor.
* Check coolant thermosensor for correct resistance.
* Check idle air control valve function.
* Check for cracks and poor connections (vacuum leaks) at airflow meter or throttle body.
* Check O2 sensor for fluctuating 0.1-1.0 volt output while increasing and decreasing engine RPM.
* Verify throttle position sensor has correct adjustment and resistance value.
* Check purge valve function.
* Check for poor fuel quality.

HIGH IDLE AFTER WARM UP

Carbureted Models (B2200 Federal)
* Ensure no vacuum leaks are present.
* Check choke and fast idle cam adjustment and operation.
* Check throttle cable adjustment.
* Verify ignition timing is correct.
* Verify dashpot disengages throttle lever at 1900-2100 RPM.

Fuel Injected Models
* Verify correct throttle body dashpot adjustment (if equipped).
* Check idle air control valve and ISC valve operation.
* Check air intake system for leaks or restriction.
* Check throttle cable adjustment.

* Check coolant temperature sensor resistance.
* Ensure fuel system pressure is correct.
* Check airflow meter for cracks. Verify correct airflow operation and resistance value.
* Check ignition timing.

ENGINE STALLS

Carbureted Models (B2200 Federal)
* Ensure correct choke adjustment and operation.
* Check ignition system for intermittent operation.
* Ensure idle mixture adjustment is correct.
* Check vacuum hoses for leakage and correct routing.
* Check PCV operation by clamping hose shut. If problem goes away, replace PCV valve.
* Check A/C cut-off system.
* Check altitude compensator valve operation.
* Check EGR valve condition and operation.

Fuel Injected Models (Cold)
* Ensure air filter element is clean.
* Check fuel filter for restriction.
* Check EGR valve condition and operation.
* Check for airflow meter or ISC valve malfunction.
* Ensure fuel system pressure is correct.
* Check air intake system for vacuum leaks.
* Check coolant temperature sensor resistance.
* Verify correct throttle position sensor adjustment and resistance value.
* Check neutral switch (M/T) or inhibitor switch (A/T).

Fuel Injected Models (Warm)
* Check PCV system for restrictions.
* Check air valve or ISC valve for malfunction.
* Check connections at airflow meter or throttle body.
* Check operation of lock-up torque converter.
* Check coolant temperature sensor resistance.
* Ensure fuel system pressure is correct. Use ohmmeter to verify correct fuel injector resistance.
* Check throttle bore for dirt and carbon.

ENGINE MISFIRES OR HAS LACK OF POWER

Carbureted Models (B2200 Federal)
* Ensure fuel level is at specified mark on carburetor sight glass.
* Ensure fuel system pressure is correct.
* Check fuel filter for restriction.
* Verify base timing is correct and advance system is functional.
* Check EGR valve operation.
* Check for restricted catalytic converter.

* Check ignition system for intermittent operation.
* Check carburetor mixture control duty cycle using dwell meter.

Fuel Injected Models
* Verify air filter is clean.
* Check fuel filter for restriction.
* Check vacuum switching valve operation.
* Check coil resistance.
* Check airflow meter for cracks.
* Check EGR valve and solenoid for correct operation (if equipped).
* Check purge control valve operation.
* Check airflow operation and resistance value.
* Check atmospheric pressure sensor.
* Check ignition system for intermittent operation.
* Check for restricted catalytic converter.
* Check Variable Resonance Induction System (VRIS) for correct operation (if equipped).
* Check Variable Inertia Charge System (VICS) for correct operation (if equipped).
* Verify crank angle sensor (permanent magnet type) has correct resistance values.
* Check A/C cut-off system (if equipped).
* Ensure fuel system pressure is correct.
* Check turbocharger system (if equipped) for wear or malfunctioning parts. Turbo system inspection should include the following:
  * Turbo Precontrol
  * Wastegate Control
  * Turbo Control
  * Charge Control
  * Charge Relief

ENGINE RUNS ROUGH ON DECELERATION

Fuel Injected Models
* Verify idle speed is correct.
* Verify correct throttle body dashpot adjustment.
* Check coolant thermosensor and throttle position sensor.
* Check air valve or ISC valve for malfunction.
* Check fuel pressure regulator.
* Check O2 sensor operation.
* Check throttle position sensor.
* Check airflow sensor operation.

BACKFIRE IN EXHAUST SYSTEM

Carbureted Models (B2200 Federal)
* Verify base timing is correct and timing advance system is functional.
* Ensure air filter element is clean.

* Check neutral switch (M/T) or inhibitor switch (A/T).
* Check mixture control valve.
* Check pulse air injection system.
* Verify dashpot disengages throttle lever at 2700-2900 RPM.
* Check air cleaner reed valves.
* Verify no leaks exist in exhaust system.

Fuel Injected Models
* Verify base timing is correct and advance system is functional.
* Ensure air filter element is clean.
* Check throttle body dashpot adjustment (if equipped).
* Check coolant temperature sensor and throttle position sensor.
* Check air valve, ISC switch and idle switch operation.
* Check intake air system and throttle body electrical connections for vacuum leaks.
* Ensure fuel system pressure is correct.
* Verify no leaks exist in exhaust system.

POOR FUEL MILEAGE

Carbureted Models (B2200 Federal)
* Verify correct carburetor idle speed and fuel mixture adjustment.
* Verify base timing is correct and timing advance system is functional.
* Ensure air intake system is unrestricted.
* Verify choke is fully open after engine is warm.
* Ensure fuel level is at specified mark on carburetor sight glass.
* Check carburetor mixture control duty cycle using dwell meter.

Fuel Injected Models
* Check injectors for leakage.
* Verify correct throttle body dashpot adjustment.
* Ensure correct throttle position sensor adjustment and resistance value.
* Check intake air and coolant temperature sensor.
* Ensure fuel system pressure is correct.
* Ensure exhaust system is unrestricted.

EXCESSIVE OIL CONSUMPTION

* Check for restricted PCV system.
* Check turbo system for malfunction.
* Check metering oil pump (RX-7).
* Check for worn engine parts.

ABNORMAL NOISE OR KNOCKING

Fuel Injected Models
* Check engine oil and coolant level.
* Check turbo system (if equipped) for damage and wear.
* Check engine control system for malfunctioning components.

System inspection should include following components:

* Airflow Meter
* Idle Switch
* Vacuum Routing (For Leaks)
* Neutral Safety Switch (A/T)
* Clutch Switch (M/T)
* EGR Valve Position Sensor (If Equipped)
* Knock Sensor (If Equipped)
* Throttle Position Sensor
* Coolant Temperature Sensor
* Coolant Thermoswitch
* Inhibitor Switch (A/T)
* Electronic Controlled Automatic Transmission (ECAT) Unit

INTERMITTENTS

INTERMITTENT PROBLEM DIAGNOSIS

Intermittent fault testing requires duplicating circuit or component failure to identify problem. These procedures may lead to computer setting a fault code (on some systems) which may help in diagnosis.

If problem vehicle does not produce fault codes, monitor voltage or resistance values using a DVOM while attempting to reproduce conditions causing intermittent fault. A status change on DVOM indicates a fault has been located.

Use a DVOM to pinpoint faults. When monitoring voltage, ensure ignition switch is in ON position or engine is running. Ensure ignition switch is in OFF position or negative battery cable is disconnected when monitoring circuit resistance. Status changes on DVOM during test procedures indicate area of fault.

TEST PROCEDURES

Intermittent Simulation

To reproduce conditions creating an intermittent fault, use the following methods:

* Lightly vibrate component.
* Heat component.
* Wiggle or bend wiring harness.
* Spray component with water.
* Remove/apply vacuum source.

Monitor circuit/component voltage or resistance while simulating intermittent. If engine is running, monitor for self-diagnostic codes. Use test results to identify a faulty component or

circuit.

END OF ARTICLE

I - SYSTEM/COMPONENT TESTS - EFI
Article Text
1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 07:16AM

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda System & Component Testing - Fuel Injection

B2200, B2600i, Miata, MPV, MX-3, MX-6,
Navajo, Protege, RX7, 323, 626, 929

INTRODUCTION

Before testing separate components or systems, perform procedures in F - BASIC TESTING article. Since many computer-controlled and monitored components set a trouble code if they malfunction, also perform procedures in H - TESTS W/O CODES article.

NOTE: Testing individual components does not isolate shorts or opens. Perform all voltage tests using a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless stated otherwise in test procedure. Use ohmmeter to isolate wiring harness shorts or opens.

AIR INDUCTION SYSTEMS

TURBOCHARGER (RX7)

Air By-Pass Valve
Remove air by-pass valve. Connect vacuum pump to port "A" of valve. See Fig. 1. Apply 10 in. Hg to port "A", and blow air into port "B". Replace air by-pass valve if air does not flow from port "B" to port "C".

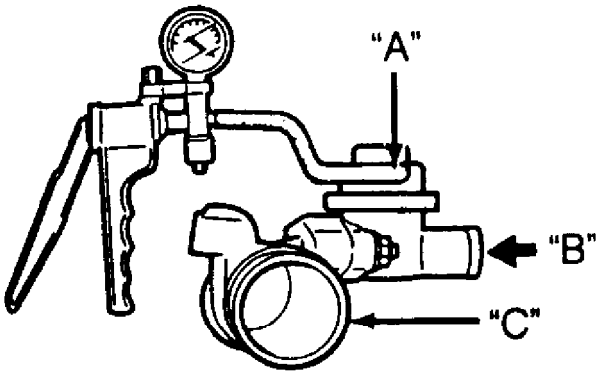


Fig. 1: Testing Air By-Pass & Charge Relief Valves (RX7)
Courtesy of Mazda Motors Corp.

Compressor & Turbine Wheel Deflection
Allow engine to cool. Remove air intake tube. Turn compressor wheel. Replace turbocharger if wheel does not turn freely or if wheel touches housing.

Charge Relief Valve

Remove charge relief valve. Connect vacuum pump to port "A" of valve. See Fig. 1. Apply 8 in. Hg to port "A", and blow air into port "B". Replace charge relief valve if air does not flow from port "B" to port "C".

Intercooler

Remove intercooler. Inspect for cracks, restriction or damage. Replace as necessary.

Oil Passage Inspection

Ensure engine is cool. Remove oil return pipe. Verify oil passage in turbocharger and oil return pipe are not blocked with carbonized oil. Replace turbocharger and return pipe as necessary.

Solenoid Valves (Turbo Precontrol & Wastegate Control)

1) Remove pressure chamber from intake manifold. Disconnect vacuum hoses. Disconnect solenoid valve connector and solenoid valves. Blow air through air tube and verify air does not flow. If air flows, replace solenoid valve.

2) Apply 12 volts and ground to solenoid valve connector. See Fig. 2. Blow air through air tube and verify air passes freely. If air does not pass freely with 12 volts applied, replace solenoid valve.

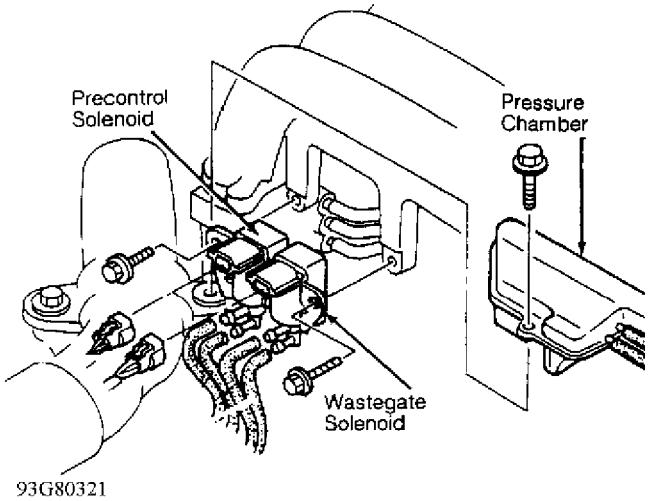


Fig. 2: Testing Solenoid Valves (RX7)
Courtesy of Mazda Motors Corp.

Charge Actuator

1) Ensure engine is cool. Remove hose connected to actuator. Connect vacuum pump to charge actuator. See Fig. 3.

2) Apply 2 in. Hg to charge actuator. Ensure actuator rod moves when vacuum is applied. If actuator rod does not move, replace charge actuator.

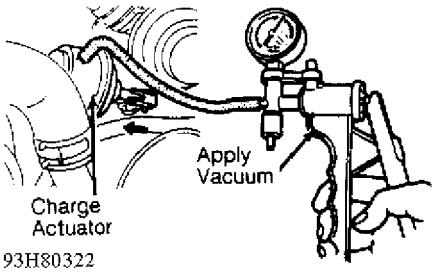


Fig. 3: Testing Charge Actuator (RX7)
Courtesy of Mazda Motors Corp.

Control Actuator

1) Ensure engine is cool. Remove hose connected to actuator. Connect air pressure source to pressure gauge. See Fig. 4. Apply air pressure to actuator.

CAUTION: DO NOT allow pressure to exceed 11 psi (.8 kg/cmý).

2) Apply 7 psi (0.5 kg/cmý) of compressed air. Ensure actuator rod moves when air pressure is applied. If actuator rod does not move, replace control actuator.

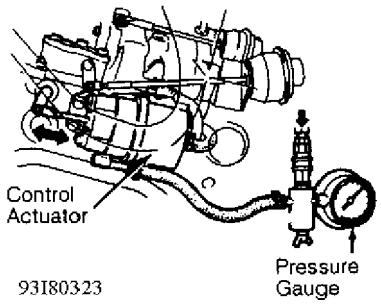


Fig. 4: Testing Control Actuator (RX7)
Courtesy of Mazda Motors Corp.

Precontrol Actuator

1) Ensure engine is cool. Remove hose connected to actuator. Connect air pressure source to pressure gauge. See Fig. 5. Apply air pressure to actuator.

CAUTION: DO NOT allow pressure to exceed 14 psi (1.0 kg/cmý).

2) Apply 10-14 psi (0.7-1.0 kg/cmý) of compressed air. Ensure actuator rod moves when air pressure is applied. If actuator rod does not move, replace precontrol actuator.

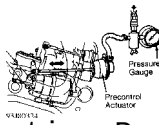


Fig. 5: Testing Precontrol Actuator (RX7)
Courtesy of Mazda Motors Corp.

Wastegate Actuator

1) Ensure engine is cool. Remove hose connected to actuator. Connect air pressure source to pressure gauge. See Fig. 6. Apply air pressure to actuator.

CAUTION: DO NOT allow pressure to exceed 14 psi (1.0 kg/cmý).

2) Apply 10-14 psi (0.7-1.0 kg/cmý) of compressed air. Ensure actuator rod moves when air pressure is applied. If actuator rod does not move, replace wastegate actuator.

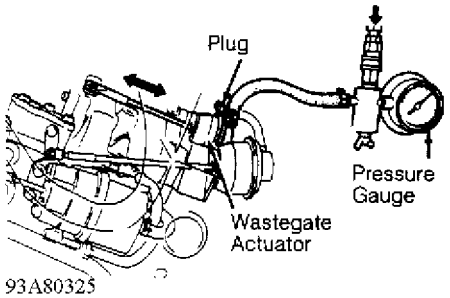


Fig. 6: Testing Wastegate Actuator (RX7)
Courtesy of Mazda Motors Corp.

DOUBLE THROTTLE CONTROL (RX7)

System Check

1) With engine cold, start engine. Ensure actuator rod is pulled in. See Fig. 7. If rod is not pulled in, check operation of coolant thermosensor and solenoid valve. Also check and repair any vacuum leaks. Apply vacuum to double throttle actuator. If rod does not pull in, replace double throttle actuator.

2) Warm engine until engine coolant temperature is greater than 176øF (80øC). Ensure actuator rod extends. If rod does not extend, check operation of coolant thermosensor and solenoid valve.

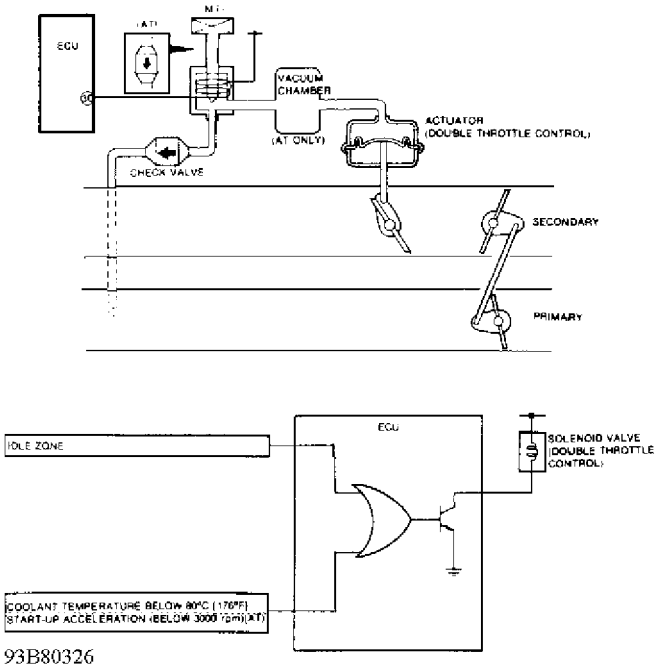


Fig. 7: View Of Double Throttle Control System (RX7)

VARIABLE INERTIA CHARGING SYSTEM (PROTEGE DOHC & 929)

System Check (Protege DOHC)

Connect tachometer to IG terminal of diagnostic connector. See Fig. 8. Start engine, and operate it at idle. Ensure shutter valve actuator rod is retracted at idle. See Fig. 9. Gradually increase engine speed to 5000 RPM and ensure actuator rod extends. If necessary, check Variable Inertia Charging System (VICS) components.

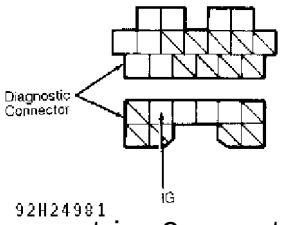


Fig. 8: Diagnostic Connector Terminal ID (MX-3 DOHC & Protege DOHC)
Courtesy of Mazda Motors Corp.

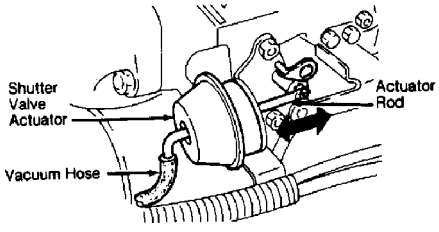


Fig. 9: Locating Shutter Valve Actuator & Rod
Courtesy of Mazda Motors Corp.

System Check (929)

Start engine, and operate it at idle. Ensure shutter valve actuator rod is retracted at idle. See Fig. 9. Actuator rod should extend when engine is started, for 5 seconds after engine is started and when engine is operating at 1100-4800 RPM with throttle opened in "D" range. If necessary, check Variable Inertia Charging System (VICS) components.

Check Valve (929)

Remove check valve. Blow air through port "A", and verify flow through port "B". Ensure air does not flow in reverse direction. Replace as necessary.

Solenoid Valve

Remove solenoid valve. Blow air through port "B". See Fig. 10. Ensure air flows from valve air filter. Connect 12 volts and a ground to solenoid valve terminals. Blow air through valve port "B", and ensure air flows from port "A". Replace solenoid valve as necessary.

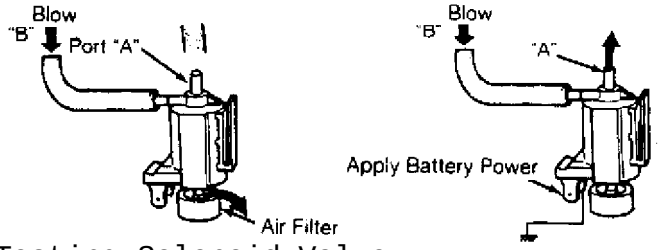


Fig. 10: Testing Solenoid Valve
Courtesy of Mazda Motors Corp.

Shutter Valve Actuator (Protege DOHC)

Disconnect vacuum hose from shutter valve actuator. See Fig. 9. Ensure shutter valve rod moves in and out smoothly. Place finger over hose. Ensure vacuum is present at idle. Reconnect vacuum hose on actuator and ensure rod retracts. Replace as necessary.

Shutter Valve Actuator (929)

Disconnect vacuum hose from shutter valve actuator. See Fig. 9. Connect vacuum pump to actuator. Apply vacuum and verify shutter valve rod retracts. Replace as necessary.

Shutter Valve (929)

Shutter valve stopper bolt is preset at factory. DO NOT adjust shutter valve stopper bolt. Remove shutter valve actuator. Ensure shutter valve rotates smoothly. See Fig. 11. Replace dynamic chamber if valve is stuck or does not rotate smoothly.

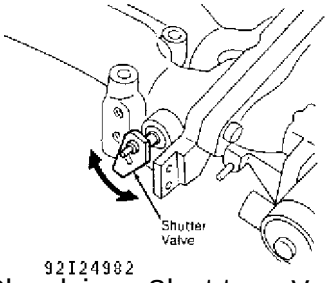


Fig. 11: Checking Shutter Valve Rotation (929)
Courtesy of Mazda Motors Corp.

Vacuum Chamber (Protege DOHC)
Remove vacuum chamber. Blow air through port "A" and verify flow through port "B". See Fig. 12. Ensure air does not flow in reverse direction. Replace as necessary.

Vacuum Chamber (929)
Remove vacuum chamber. Visually inspect vacuum chamber for clogging, cracks and damage. Replace as necessary.

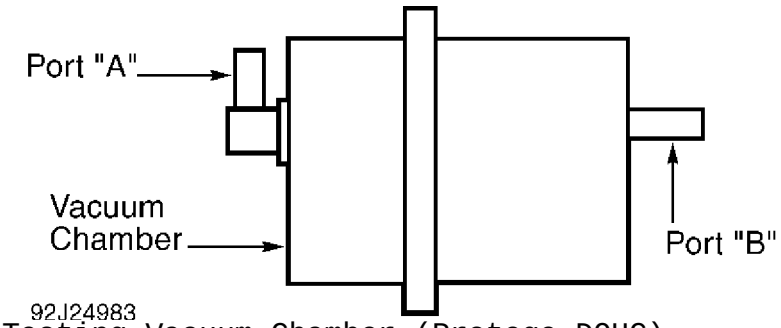


Fig. 12: Testing Vacuum Chamber (Protege DOHC)
Courtesy of Mazda Motors Corp.

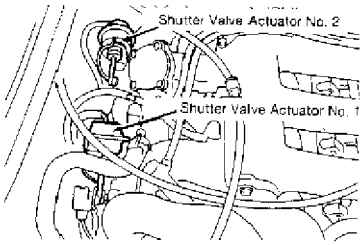
VARIABLE RESONANCE INDUCTION SYSTEM (MPV 3.0L, MX-3 DOHC, MX-6 2.5L & 626 2.5L)

System Check (MX-3 DOHC, MX-6 2.5L & 626 2.5L)
Connect tachometer to IG terminal of diagnostic connector. See Fig. 8. Start engine, and operate it at idle. Manually open throttle valve. Ensure shutter valve actuator rods No. 1 and 2 retract at specified RPM. See VRIS RPM SPECIFICATIONS table. See Fig. 13. If necessary, check Variable Resonance Induction System (VRIS) components.

VRIS RPM SPECIFICATIONS TABLE

RPM	Position
MX-3 DOHC	
Shutter Valve Actuator Rod No. 1	
Less Than 1900	Closed
1900-2600	Open

2600-4000 ..... Closed
4000-6300 ..... Open
Greater Than 6300 ..... Closed
Shutter Valve Actuator Rod No. 2
Less Than 1900 ..... Closed
1900-2600 ..... Open
2600-4700 ..... Closed
4700-6300 ..... Open
Greater Than 6300 ..... Closed
MX-6 2.5L & 626 2.5L
Shutter Valve Actuator Rod No. 1
Less Than 3250 ..... Closed
3250-4250 ..... Open
4250-6250 ..... Open
Greater Than 6250 ..... Closed
Shutter Valve Actuator Rod No. 2
Less Than 3250 ..... Closed
3250-4250 ..... Closed
4250-6250 ..... Open
Greater Than 6250 ..... Closed



92A24984
Fig. 13: Locating Shutter Valve Actuators (MX-3 DOHC, MX-6 2.5L & 626 2.5L)
Courtesy of Mazda Motors Corp.

Check Valve
Remove check valve. Blow air through port "A" and verify flow through port "B". Ensure air does not flow in reverse direction. Replace as necessary.

Shutter Valve Actuator (MPV 3.0L)
1) Remove shutter valve actuator protector cover. Remove "C" clip. Disconnect shutter valve actuator vacuum hose. See Fig. 9. Remove shutter valve actuator.
2) Apply vacuum to shutter valve actuator. See Fig. 14. Ensure rod retracts into actuator. Replace shutter valve actuator if rod does not retract. With shutter valve actuator removed, ensure shutter valve rod moves smoothly. Replace as necessary.

Shutter Valve Actuators (MX-3 DOHC, MX-6 2.5L & 626 2.5L)
Disconnect vacuum hose from shutter valve actuators No. 1 and 2. See Fig. 9 or 13. Connect vacuum pump to actuator. See Fig. 14. Apply vacuum to each actuator separately and verify shutter valve rod

retracts. Replace actuator as necessary.

Solenoid Valve

Disconnect vacuum hose from solenoid valve port "A". Blow air through port "B". See Fig. 10. Ensure air flows from valve air filter. Disconnect solenoid valve connector, and connect 12 volts and a ground to solenoid valve terminals. Blow air through valve port "B", and ensure air flows from port "A". Replace solenoid valve as necessary.

Vacuum Chamber

Remove vacuum chamber. Visually inspect chamber for clogging, cracks and damage. Replace as necessary.

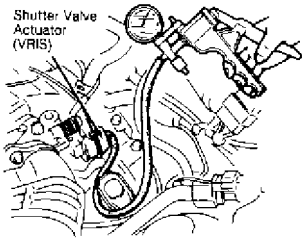


Fig. 14: Testing Shutter Valve Actuator (MPV 3.0L, MX-3 DOHC, MX-6 2.5L & 626 2.5L)
Courtesy of Mazda Motors Corp.

COMPUTERIZED ENGINE CONTROLS

POWERTRAIN CONTROL MODULE (NAVAJO)

Ground Circuits

1) Locate Powertrain Control Module (PCM) behind right kick panel. Using a DVOM, check for continuity to ground on PCM terminals No. 40 and 60. See Fig. 15. Reading on DVOM should be zero ohms. If reading is not zero ohms, repair open to ground.

2) Using a voltmeter, touch negative lead of voltmeter to a good ground. Touch positive lead of voltmeter to each ground terminal. With engine running, voltmeter should indicate less than one volt. If reading is one volt or more, check for open, corrosion and loose connection on ground lead.

Power Circuits

Using a voltmeter, check for battery voltage between PCM terminal No. 1 (constant battery power) and ground. Check for battery voltage at terminals No. 37 and 57 with ignition on. If battery voltage is not present, power is not being supplied from EEC power relay. See CIRCUIT TEST B in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

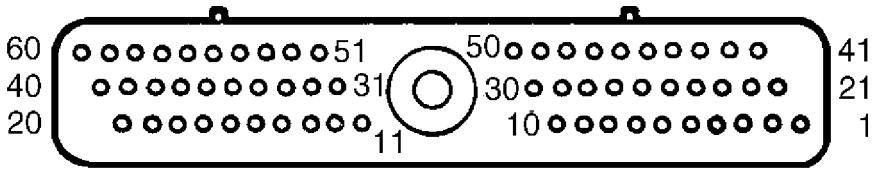


Fig. 15: Identifying PCM 60-Pin Connector Terminals (Navajo)
Courtesy of Mazda Motors Corp.

POWERTRAIN CONTROL MODULE (EXCEPT NAVAJO)

1) Locate Electronic Control Unit (ECU) or Powertrain Control Module (PCME). See ECU/PCME LOCATION table. Connect Engine Signal Monitor (49-9200-162) to ECU/PCME. See Fig. 16. Check voltage at each terminal of ECU/PCME. If input and output component voltage readings are not as specified, check faulty component. See appropriate J - PIN VOLTAGE CHARTS article, appropriate information in G - TESTS W/CODES article in the ENGINE PERFORMANCE section, and testing for appropriate component in this article.

2) If input and output component voltages are as specified and ECU/PCME voltage is incorrect, replace ECU/PCME.

CAUTION: DO NOT apply voltage to terminals "A" and "B" of engine signal monitor. See Fig. 16.

ECU/PCME LOCATION TABLE

Application	Location
B2200, B2600i, RX7 & 929	Behind Passenger Front Side Trim Panel
Miata & MPV	Under Passenger Front Floor Mat
MX-3, Protege & 323	Behind Center Console
MX-6 & 626	Behind Center Console Top Cover

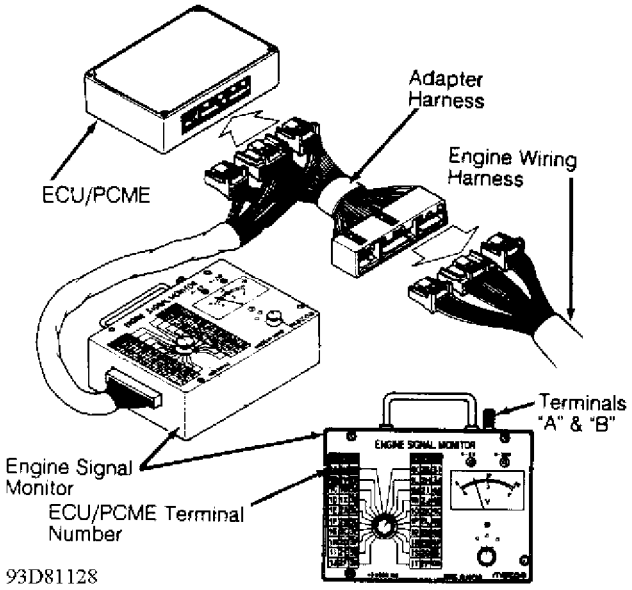


Fig. 16: Testing Engine Control Unit (ECU)
Courtesy of Mazda Motors Corp.

ENGINE SENSORS & SWITCHES

A/C SWITCH

See A/C CUT-OFF CONTROL SYSTEM (B2200, B2600i, MIATA, MPV, MX-3, MX-6, RX7, 626 & 929) under A/C CLUTCH under MISCELLANEOUS CONTROLS.

AIR CHARGE TEMPERATURE (ACT) SENSOR

MX-6 2.0L & 626 2.0L

Remove sensor from air cleaner housing. With sensor disconnected, measure resistance between sensor terminals. See ACT SENSOR RESISTANCE table. Replace sensor as necessary.

Navajo

Locate sensor on top left side of engine, behind idle air by-pass valve. With sensor disconnected, measure resistance between sensor terminals. See ACT SENSOR RESISTANCE table. Replace sensor as necessary.

ACT SENSOR RESISTANCE TABLE

Temperature	Ohms
MX-6 & 626 2.0L	
77øF (25øC)	29,000-36,300
185øF (85øC)	3300-3700
Navajo	

50øF (10øC)	58,750
68øF (20øC)	37,300
176øF (80øC)	384
194øF (90øC)	280

AIRFLOW SENSOR

B2200, B2600i, MX-6 2.0L, MPV 2.6L & 626 2.0L

1) Pull rubber boot back from airflow sensor connector. Backprobe sensor connector, and check terminal voltages. See Fig. 17. See AIRFLOW SENSOR TERMINAL VOLTAGES table.

2) If voltages are not correct, check wiring for open or short. If wiring is okay, check burn-off operation. See BURN-OFF OPERATION (B2200, B2600i & MPV 2.6L) procedure. If ECU control of burn-off operation is okay but voltages are still incorrect, replace airflow sensor.

NOTE: Airflow sensors on MX-6 2.0L and 626 2.0L do not have burn-off operation.

AIRFLOW SENSOR TERMINAL VOLTAGES TABLE

Terminal Wire Color	Ignition On Volts	Engine Running Volts
B2200, B2600i & MPV		
Black/Yellow (Power Supply) (1)	12.0	12.0
Green/Orange (Burn-Off)	0	0
Green/Black (Airflow Mass)	1.0-2.0	1.9-5.0
Green/Yellow (Ground) (1)	0	0
Black/Orange (Ground)	0	0
MX-6 & 626 2.0L		
Red/Black (Power Supply)	12.0	12.0
Black/Blue (Airflow Mass)	1.0-1.5	1.5-5.0
Black (Ground)	0	0

(1) - Black/White wire on MPV 2.6L.

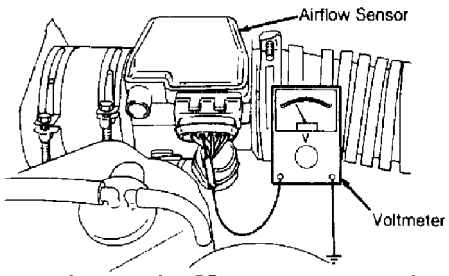


Fig. 17: Testing Airflow Sensor (B2200, B2600i, MX-6 2.0L, MPV 2.6L & 626 2.0L)
Courtesy of Mazda Motors Corp.

Burn-Off Operation (B2200, B2600i & MPV 2.6L)

1) Perform this test if airflow sensor failed voltage test. Disconnect negative battery cable to reset ECU. Reconnect negative battery cable.

2) Bring engine to normal operating temperature. Pull back rubber boot from airflow sensor connector. Operate engine at about 2000 RPM for 3 minutes with transmission in Neutral.

3) Turn ignition off. Backprobe airflow sensor Green/Orange wire at ECU terminal 2H using a voltmeter. Voltage should be zero volts immediately after ignition is turned off. About 8-12 volts should be present momentarily, 2-5 seconds after ignition switch is turned to OFF position.

4) If voltages are as specified, replace airflow sensor. If voltages are not as specified, check voltage and related wiring at ECU terminals 2P, 2Q and 1I (B2200 and B2600i) or ECU terminals 2O, 2Q and 1I (MPV 2.6L). See J - PIN VOLTAGE CHARTS article.

AIRFLOW METER

Miata, MPV 3.0L, MX-3, MX-6 2.5L, Protege, 323, 626 2.5L & 929

Inspect airflow meter for damage, and ensure measuring plate or cone moves smoothly. See Fig. 18, 19 or 20. Disconnect airflow meter electrical connector. Move measuring plate or cone, and measure resistance between terminals. See appropriate AIRFLOW METER TERMINAL RESISTANCE table. Replace sensor as necessary.

AIRFLOW METER TERMINAL RESISTANCE TABLE
(MIATA, MX-3 SOHC, PROTEGE & 323)

Terminals (1)	Fully Closed Ohms	Fully Open Ohms
E2 & Vs	(2) 200-600	20-1000
E2 & Vc	200-400	200-400
E2 & THAa (3)		
-4øF (-20øC)	13,600-18,400	13,600-18,400
68øF (20øC)	2210-2690	2100-2690
140øF (60øC)	493-667	493-667
E1 & Fc	Infinite	0

(1) - See Fig. 18 for terminal identification.
(2) - 20-600 ohms on 323 and Protege.
(3) - Intake air thermosensor.

AIRFLOW METER TERMINAL RESISTANCE TABLE (MPV 3.0L)

Terminals (1)	Fully Closed Ohms	Fully Open Ohms

E2 & Vs	20-400		20-1000
E2 & Vc	100-300		100-300
E2 & Vb	200-400		200-400
E2 & THAa (2)			
-4øF (-20øC)	13,600-18,400		13,600-18,400
68øF (20øC)	2210-2690		2210-2690
140øF (60øC)	493-667		493-667
E1 & Fc	Infinite		0

(1) - See Fig. 19 for terminal identification.
(2) - Intake air thermosensor.

AIRFLOW METER TERMINAL RESISTANCE TABLE
(MX-3 DOHC, MX-6 2.5L, 626 2.5L & 929)

Terminals (1)	Temperature	Ohms
E2 & Vs		
Closed	68øF (20øC)	20-600
Open	68øF (20øC)	20-1,000
E2 & Vc (2)	68øF (20øC)	200-400
E2 & THA (3)	-4øF (-20øC)	10,600-19,400
	68øF (20øC)	2,000-2,700
	140øF (60øC)	400-700

(1) - See Fig. 20 for terminal identification.
(2) - Measurement is from closed to open.
(3) - Intake air thermosensor.

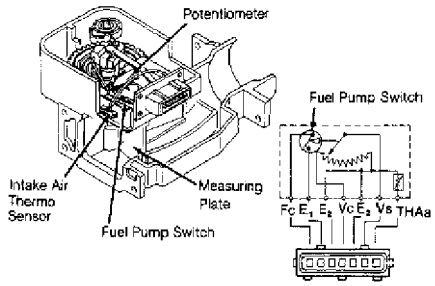


Fig. 18: Airflow Meter Terminal ID (Miata, MX-3 SOHC, Protege & 323)
Courtesy of Mazda Motors Corp.

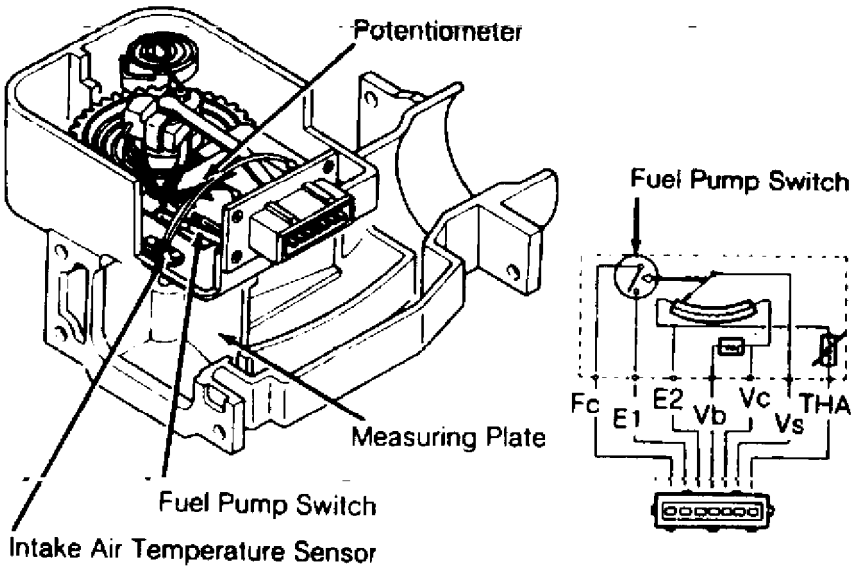
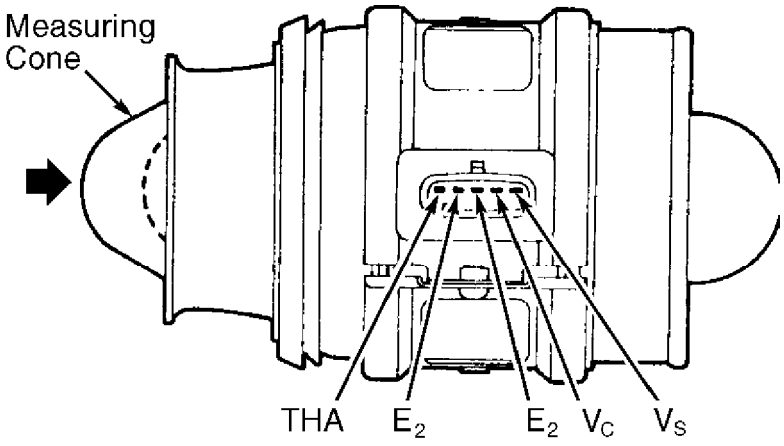


Fig. 19: Airflow Meter Terminal ID (MPV 3.0L)
Courtesy of Mazda Motors Corp.



92C24986
Fig. 20: Airflow Meter Terminal ID (MX-3 DOHC, MX-6 2.5L, 626 2.5L & 929)
Courtesy of Mazda Motors Corp.

ATMOSPHERIC PRESSURE SENSOR

See J - PIN VOLTAGE CHARTS article. On MX-6 2.0L A/T and 626 2.0L A/T, see TROUBLE CODE CHART 14 in H - TESTS W/O CODES article.

BAROMETRIC PRESSURE (BARO) SENSOR

RX7

1) Warm engine to operating temperature. Turn all accessories off. Connect positive lead of voltmeter to BARO sensor terminal "A" and negative lead to terminal "B".

2) With engine at idle, voltmeter should read 1.3-1.6 volts. Disconnect hose from BARO sensor and plug. See Fig. 21. Voltmeter should read 2.38-2.78 volts.

3) Connect a vacuum pump to BARO sensor, and apply 29 in. Hg. Voltmeter should read 4.35-4.65 volts. If voltmeter readings do not test as described, replace BARO sensor.

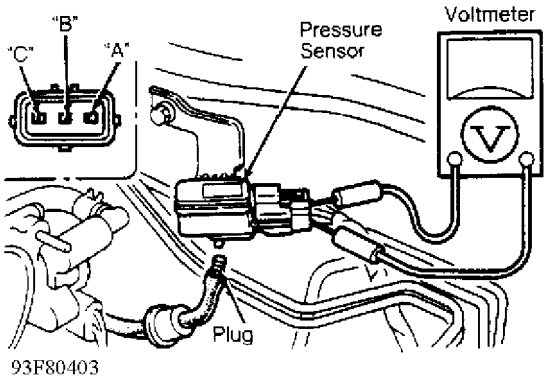


Fig. 21: Testing BARO Sensor (RX7)
Courtesy of Mazda Motors Corp.

BRAKELIGHT SWITCH

Disconnect brakelight switch connector. Measure resistance between terminals of brakelight switch. With brake pedal released, continuity should not exist. With brake pedal depressed, continuity should be present. Replace switch as necessary.

CAMSHAFT POSITION SENSOR (CMP)

Navajo

Camshaft Position Sensor (CMP) is a Hall-Effect switch, located on top rear of engine. See CIRCUIT TEST DR in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

CENTRAL PROCESSING UNIT (CPU)

MPV, RX7 & 929

CPU acts as an electrical load sensor. On MPV, remove CPU from behind left side of instrument panel. On RX7, remove CPU from right side kick panel above ECU. On 929, remove CPU from behind left front side trim panel near door. Check voltage at terminals of CPU connector. See appropriate CPU UNIT VOLTAGE CHART. If voltages are incorrect, check appropriate circuit. If circuits are okay but voltages are still incorrect, replace CPU.

Terminal	Connected to	Test condition	Specification	To correct
b	Battery (through ROOM 10A fuse)	Constant	Approx. 12V	Check ROOM 10A fuse and wiring harness
c	Engine control unit	Electrical load OFF (ignition switch ON)	Approx. 12V	Check engine control unit and wiring harness
		Electrical load ON (Ignition switch ON)	Below 1.5V	
d	Ground	Constant	0V	Check wiring harness
f	Headlight switch	Headlight switch ON	Approx. 12V	Check headlight switch and wiring harness
g	Blower fan switch	Blower fan switch High or Super high position	0V	Check blower fan switch and wiring harness
h	Rear window defroster switch	Rear window defroster switch ON	0V	Check rear window defroster switch and wiring harness
j	Ignition switch	Ignition switch ON	Approx.12V	Check ignition switch and wiring harness

Fig. 22: CPU Unit Voltage Chart (MPV 2.6L)
Courtesy of Mazda Motors Corp.

Terminal	Connected to	Test condition	Specification	To correct
b BLU/RED WIRE	Battery (through ROOM 10A fuse)	Constant	Approx. 12V	Check ROOM 10A fuse and wiring harness
c YEL/RED WIRE	Engine control unit	Ignition switch ON	Approx. 12V	Check engine control unit and wiring harness
d	Ground	Constant	0V	Check wiring harness
f RED/GRN WIRE	Headlight switch	Headlight switch ON	Approx. 12V	Check headlight switch and wiring harness
g BLUE WIRE	Blower fan switch	Blower fan switch High or Super-high position	0V	Check blower fan switch and wiring harness
h WHT/YEL WIRE	Rear window defroster switch	Rear window defroster switch ON	0V	Check rear window defroster switch and wiring harness
j BLK/WHT WIRE	Ignition switch	Ignition switch ON	Approx. 12V	Check ignition switch and wiring harness

90I18372

Fig. 23: CPU Unit Voltage Chart (MPV 3.0L)
Courtesy of Mazda Motors Corp.

Terminal	Input	Output	Connected to	Test condition	Correct voltage	Remark
A	–	–	Main relay	Ignition switch ON	V_B	–
B	○		TNS relay	Position light ON	0V	–
				Position light OFF	V_B	
C	○		Water thermoswitch	Engine coolant temperature below 108°C	V_B	Ignition switch ON
				Engine coolant temperature above 108°C {221°F}	0V	
D	○		Rear window defroster ready	Rear window defroster OFF	V_B	Ignition switch ON
				Rear window defroster ON	Below 1.0V	
E	○		Blower moter relay	Blower switch 3rd or 4th position	Below 1.0V	Ignition switch ON
				Blower switch 1st or 2nd position	V_B	
F	–	–	–	–	–	–
G	–	–	–	–	–	–
H		○	Self-Diagnosis checker Diagnosis connector (FEN)	Buzzer sounded for 3 sec. after ignition switch OFF → ON	Below 2.5V	● With Self-Diagnosis checker and system Selector ● With System Selector test switch at SELF TEST
				Buzzer not sounded for after 3 sec.	V_B	
				Buzzer sounded	Below 2.5V	
				Buzzer not sounded	V_B	
I	–	–	–	–	–	–
J	–	–	–	–	–	–
K		○	Malfunction indicator lamp (MIL)	Lamp illuminated for 3 sec. after ignition switch ON	Below 2.5V	With system selector test switch at SELF TEST
				Lamp not illuminated after 3 sec.	V_B	
				Lamp illuminated	Below 2.5V	
				Lamp not illuminated	V_B	
L	–	–	–	–	–	–
M	–	–	Ground	Constant	0V	–
N		○	ECU	Electrical load ON	Below 2.5V	Ignition switch ON
				Electrical load OFF	4.5~5.5	
O		○	Cooling fan relay	Engine coolant temperature below 105°C	Below 2.5V	Ignition switch ON
				Engine coolant temperature above 105°C	V_B	
P	○		Ignition switch	While cranking	V_B	–
				Ignition switch ON	Below 1.0V	

93G80404

Fig. 24: CPU Unit Voltage Chart (RX7)
Courtesy of Mazda Motors Corp.

CPU UNIT VOLTAGE CHART (929)

Connector	Terminal	Connected to	Test condition		Specification (V)
A (14-pin)	3A	Interior lamps, courtesy lamp	Constant		12V
	3B	Battery	Constant		12V
	3C	Door lock relay (lock)	Constant		12V
	3D	Body ground	Constant		0
	3E	Headlights	Light switch ON 2nd step, low beam		12V
	3F	Door lock relay (unlock)	Constant		12V
	3G	Front fog light relay	Constant		12V
	3H	Door switch (passenger side)	Passenger door open; check for continuity to body ground		Yes
			Passenger door closed; check for continuity to body ground		No
	3I	Headlight relay	Light switch ON 2nd step		0
			Other		12V
	3J	Ignition switch	Ignition switch ON		12V
	3K	Ignition switch	Ignition switch ACC		12V
	3L	TNS relay	Light switch ON		12V
	3M	Door switch (driver side)	Driver door open; check for continuity to body ground		Yes
			Driver door closed; check for continuity to body ground		No
	3N	Key reminder switch	Ignition Key in ignition switch		12V
B (16-pin)	1A	Starter cut relay	Ignition switch ON		12V
	1B	Trunk key cylinder switch	Trunk key cylinder switch ON		0
	1C	Interlock resistor	Constant		12V
	1D	Trunk switch	Trunk switch ON		0
	1E	Hazard warning output	Hazard warning switch ON		0
			Other		12V
	1F	Hood switch	Hood switch ON		0
	1G	Seat belt warning lamp	For 5 seconds from ignition switch ON		0
			Other		12V
	1H	Buckle switch	Ignition switch ON	Seat belt connected	12V
				Other	0
	1I	NA	—		—
	1J	Brake warning lamp	Ignition switch ON	Parking brake pedal released	12V
				Parking brake pedal depressed	0
	1K	NA	—		—
	1L	Parking brake switch	Ignition switch ON	Parking brake pedal released	12V
				Parking brake pedal depressed	0
	1M	NA	—		—
	1N	P range switch	Ignition switch ON, shift lever P range		5
			Other		0
	1O	NA	—		—
	1P	NA	—		—

92D24987

Fig. 25: CPU Unit Voltage Chart (929, 1 Of 2)
Courtesy of Mazda Motors Corp.

CPU UNIT VOLTAGE CHART (929 – Cont.)

Connector	Terminal	Connected to	Test condition		Specification (V)
B (20-pin)	2A	Ignition and door key illumination	Constant		12V
	2B	Outer handle switch	Door outer handle pulled		0
			Other		Approx. 4
	2C	Idle-up	Ignition switch ON.		12V
			Headlights ON		4
			Front fog lights ON		4.5
	2D	Door switch (rear door)	Rear door open; check for continuity to body ground		Yes
			Rear door closed; check for continuity to body ground		No
	2E	Rear defroster indicator	Ignition switch ON	Rear defroster switch ON	0
				Other	Approx. 5
	2F	Lock link switch (passenger side)	Locked		Approx. 5
			Unlocked		0
	2G	Interlock solenoid coil	Constant		12V
	2H	Lock link switch (driver side)	Locked		Approx. 5
			Unlocked		0
	2I	NA	—		—
	2J	Lock link switch (rear door)	Locked		Approx. 5
			Unlocked		0
	2K	+B	Constant		12V
	2L	Door key cylinder switch (passenger side)	Locked		2.5
			Unlocked		0
			Other		5
	2M	Security lamp	Constant		12V
	2N	NA	—		—
	2O	Horn relay	Constant		12V
	2P	Door lock switch	Locked		2.5
			Unlocked		0
			Other		5
	2Q	Rear defroster relay	Ignition switch ON	Rear defroster switch ON	12V
				Other	0
	2R	Door key cylinder switch (driver side)	Unlocked		0
			Others		5
	2S	Rear defroster switch	Rear defroster switch	Rear defroster switch ON	12V
				Other	0
	2T	Front fog light switch	Front fog light switch	Front fog light switch ON	12V
				Other	0

92E24988

Fig. 26: CPU Unit Voltage Chart (929, 2 Of 2)
Courtesy of Mazda Motors Corp.

CLUTCH SWITCH (M/T)

Disconnect clutch switch electrical connector. Using ohmmeter, check continuity between switch terminals. With clutch pedal depressed, continuity should be present. With clutch pedal released, continuity should not exist. Replace switch as necessary.

COLD START THERMOSWITCH

929

Remove cold start thermoswitch. Place thermoswitch and thermometer in container of coolant. Connect ohmmeter to thermoswitch terminals. Slowly heat coolant. Note resistance at specified temperatures. See COLD START THERMOSWITCH RESISTANCE table. Replace thermoswitch as necessary.

COLD START THERMOSWITCH RESISTANCE TABLE

Temperature	Ohms

68øF (20øC) 25-35
176øF (80øC) 64-76

COOLANT TEMPERATURE SWITCH

Miata, MX-3 SOHC, Protege & 323

1) Remove switch from radiator or engine block. Place switch and thermometer in container of coolant. Connect ohmmeter to coolant temperature switch terminals. Slowly heat coolant.

2) Note temperature at which continuity is present between switch terminals. Continuity should be present with coolant temperature greater than 207øF (97øC). Continuity should not exist with temperature less than 194øF (90øC). Replace switch as necessary.

CRANK ANGLE SENSOR

See IGNITION CHECKS in F - BASIC TESTING article.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Remove engine coolant temperature sensor. Place sensor and thermometer in container of coolant. Connect ohmmeter to sensor terminals. Slowly heat coolant. Note resistance at specified temperatures. See appropriate ECT SENSOR RESISTANCE table. Replace sensor as necessary.

ECT SENSOR RESISTANCE TABLE (B2200, B2600I, MIATA, MPV & 929)

Temperature	Ohms
-4øF (-20øC)	(1) 14,600-17,800
68øF (20øC)	2,200-2,700
176øF (80øC)	(2) 200-400

(1) - Resistance is 14,500-17,800 ohms on B2200, B2600i and MPV 2.6L.
(2) - Resistance is 280-350 ohms on B2200, B2600i and MPV 2.6L; 290-350 ohms on Miata and MPV 3.0L.

ECT SENSOR RESISTANCE TABLE
(MX-3, MX-6, PROTEGE, RX7, 323 & 626)

Temperature	Ohms
-4øF (-20øC)	14,600-17,800
68øF (20øC)	2,200-2,700
104øF (40øC)	1,000-1,300
140øF (60øC)	500-650
176øF (80øC)	290-350

ECT SENSOR RESISTANCE TABLE (NAVAJO)

Temperature	Ohms
50øF (10øC)	58,750
68øF (20øC)	37,300
176øF (80øC)	384
194øF (90øC)	280

EGR POSITION SENSOR

MX-3 DOHC, MX-6 2.5L, RX7, 626 2.5L & 929

See EXHAUST GAS RECIRCULATION (EGR) (MX-3 DOHC, MX-6, RX7, 626 & 929) under EMISSION SYSTEMS & SUB-SYSTEMS.

FUEL TEMPERATURE SENSOR

RX7

1) Remove circuit opening relay. Start engine and allow system to fuel pressure to bleed down. Install circuit opening relay. Remove upper intake manifold. Remove fuel temperature sensor from fuel rail.

2) Place sensor and thermometer in container of water. Connect ohmmeter to sensor terminals. Heat water. Note resistance at specified temperatures. See FUEL TEMPERATURE SENSOR RESISTANCE table. Replace sensor as necessary.

FUEL TEMPERATURE SENSOR RESISTANCE TABLE

Temperature	Ohms
68øF (20øC)	2,200-2,700
176øF (80øC)	290-350

HEAT HAZARD SENSOR

RX7

1) Remove right front seat. Lift floor mat and remove heat hazard sensor. Wrap sensor and a thermometer in aluminum foil. Place foil in a pot of oil. Connect a battery and 12-volt test light in series, to sensor terminals.

2) Heat oil to 221-239øF (105-115øC). Test light should light when sensor reaches specified temperature. If test light does not light, replace heat hazard sensor.

HEATED OXYGEN SENSOR (HO2S)

MPV 3.0L, MX-6, 626 & 929

With engine at room temperature, disconnect HO2S connector. Measure resistance across terminals "A" and "B" on MX-6 2.0L and 626 2.0L, or terminals "C" and "D" on all others. See Fig. 27. See HO2S RESISTANCE table. Replace HO2S as necessary. Also see PIN VOLTAGE CHARTS article.

HO2S RESISTANCE TABLE

Application	Ohms
MPV 3.0L	Continuity
MX-6 & 626	8
929	4-40

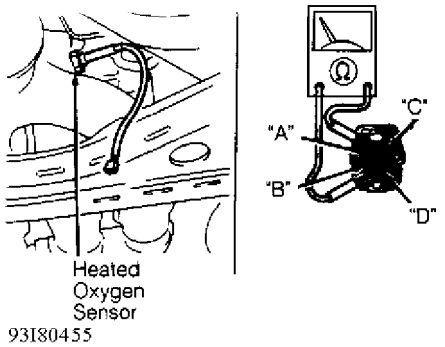


Fig. 27: Testing HO2S (MPV 3.0L, MX-6, 626 & 929)
Courtesy of Mazda Motors Corp.

Navajo

HO2S is located in exhaust pipe, upstream of the catalytic converter. Faults in sensor or circuit should set a service code. See QUICK TEST in G - TESTS W/CODES article. If no service code has been set, see CIRCUIT TEST H in G - TESTS W/CODES article for additional sensor specifications and circuit testing procedures. Ensure following conditions do not exist:

* Moisture inside sensor/harness connector.
* HO2S coated with contaminants.
* Sensor circuit open or shorted to ground.

IDLE SWITCH

B2200, B2600i, MPV 2.6L, MX-6 2.0L & 626 2.0L

1) Disconnect idle switch electrical connector. See Fig. 28. Check continuity between switch and ground. Continuity should be present with throttle valve fully closed. Continuity should not exist with throttle valve open.

2) If continuity is not as specified, check wiring harness for open or short circuits. On B2200, B2600i, MX-6 2.0L and 626 2.0L, replace idle switch and throttle body as an assembly if wiring harness is okay. On MPV 2.6L, replace idle switch if wiring harness is okay.

Miata, MPV 3.0L, MX-3, MX-6 2.5L, Protege, RX7, 323, 626 2.5L & 929

Idle switch is part of throttle position sensor. See D - ADJUSTMENTS article.

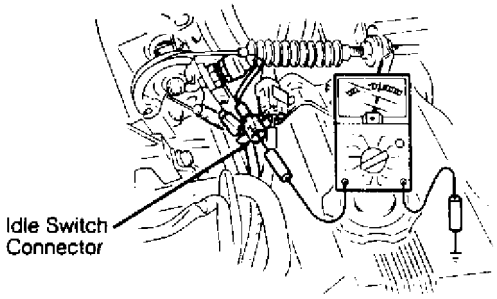


Fig. 28: Testing Idle Switch (B2200, B2600i & MPV 2.6L Shown; MX-6 2.0L & 626 2.0L Similar)
Courtesy of Mazda Motors Corp.

INERTIA FUEL SHUTOFF (IFS) SWITCH

Navajo

1) Inertia fuel shutoff switch is located under dash, right of transmission tunnel. To reset switch, ensure no fuel leaks are present. Push reset button.

2) Disconnect inertia fuel shutoff switch electrical connector. Connect ohmmeter set on 200-ohm scale across switch connector terminals. If resistance is greater than .3 ohm, replace switch.

INHIBITOR SWITCH (A/T)

Disconnect inhibitor switch electrical connector. Connect ohmmeter to indicated switch terminals. See Figs. 29-35. Continuity should be present with gearshift in Park and Neutral positions. Continuity should not exist in any other gear positions. Replace switch as necessary.

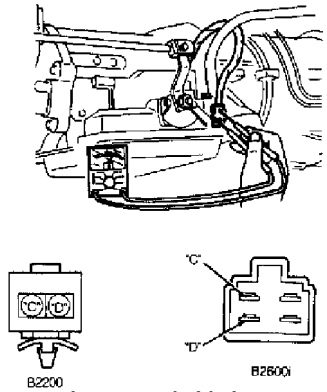


Fig. 29: Testing Inhibitor Switch (B2200 & B2600i Hyd. Controlled)
Courtesy of Mazda Motors Corp.

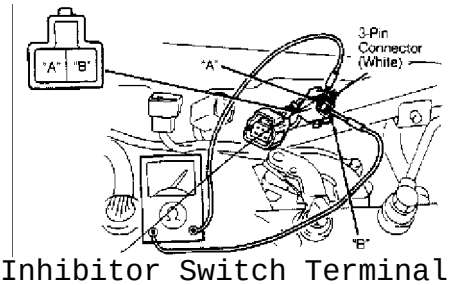


Fig. 30: Inhibitor Switch Terminal ID (B2200 & B2600i Hyd. Controlled)
Courtesy of Mazda Motors Corp.

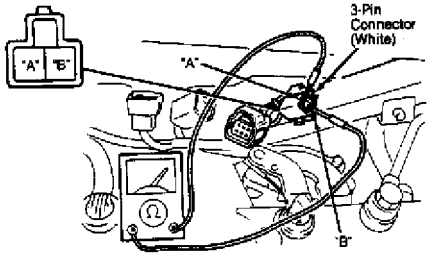


Fig. 31: Testing Inhibitor Switch (B2600i Elect. Controlled, MPV 3.0L, MX-6 & 626)
Courtesy of Mazda Motors Corp.

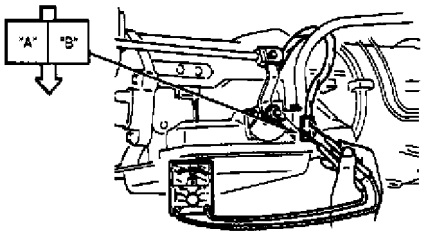


Fig. 32: Testing Inhibitor Switch (Miata)
Courtesy of Mazda Motors Corp.

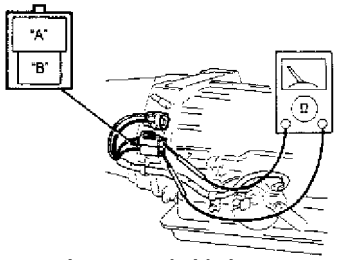


Fig. 33: Testing Inhibitor Switch (MPV 2.6L)
Courtesy of Mazda Motors Corp.

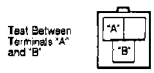


Fig. 34: Testing Inhibitor Switch (MX-3, Protege & 323)
Courtesy of Mazda Motors Corp.

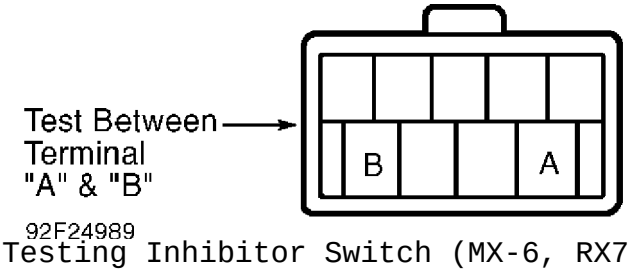


Fig. 35: Testing Inhibitor Switch (MX-6, RX7, 626 & 929)
Courtesy of Mazda Motors Corp.

INTAKE AIR THERMOSENSOR (DYNAMIC CHAMBER)

B2200, B2600i & MPV

Disconnect intake air thermosensor connector. Connect ohmmeter to switch terminals. See Fig. 36 or 37. Measure resistance of sensor at various temperatures. See INTAKE AIR THERMOSENSOR RESISTANCE table. Replace sensor as necessary.

RX7

Remove sensor from under upper intake manifold. Using a heat light, ohmmeter and thermometer, measure resistance of sensor at various temperatures. See Fig. 38. See INTAKE AIR THERMOSENSOR RESISTANCE table. Replace sensor as necessary.

929

Remove intake air thermosensor. Using a heat light, ohmmeter and thermometer, measure resistance of sensor at various temperatures. See Fig. 38. See INTAKE AIR THERMOSENSOR RESISTANCE table. Replace sensor as necessary.

INTAKE AIR THERMOSENSOR RESISTANCE TABLE

Application	Ohms
B2200, B2600i, MPV & 929	
77øF (25øC)	(1) 29,700-36,300
185øF (85øC)	3300-3700
RX7	
68øF (20øC)	2200-2700
176øF (80øC)	290-350

(1) - Resistance is 29,000-36,000 ohms on MPV.

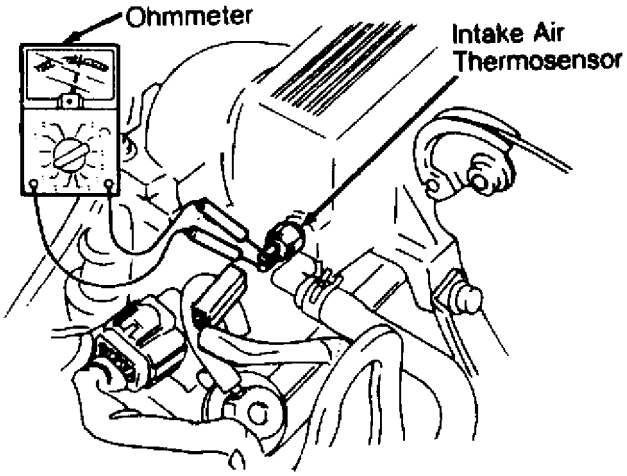


Fig. 36: Testing Intake Air Thermosensor (B2200, B2600i & MPV 2.6L)
Courtesy of Mazda Motors Corp.

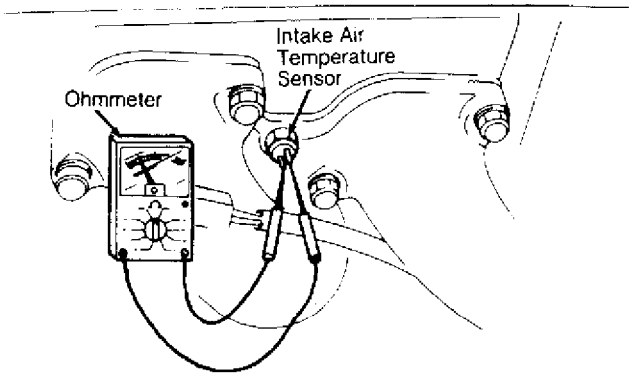


Fig. 37: Testing Intake Air Thermosensor (MPV 3.0L)
Courtesy of Mazda Motors Corp.

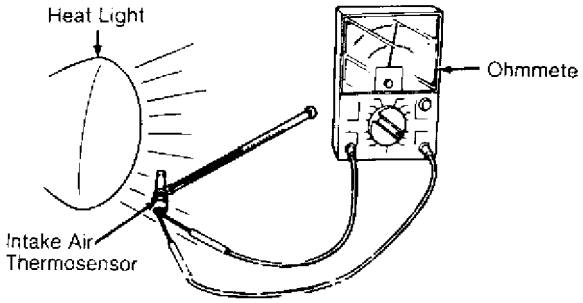


Fig. 38: Testing Intake Air Thermosensor (RX7 & 929)
Courtesy of Mazda Motors Corp.

KNOCK SENSOR

See J - PIN VOLTAGE CHARTS article.

MASS AIRFLOW (MAF) SENSOR (NAVAJO)

Faults in MAF sensor or circuit should set a service code. See QUICK TEST in G - TESTS W/CODES article. If no service code has been set, see CIRCUIT TEST DC in G - TESTS W/CODES article for sensor and circuit testing and specifications.

MILEAGE SWITCH (RX7)

See J - PIN VOLTAGE CHARTS article.

NEUTRAL SWITCH

Except Navajo (M/T)
Disconnect neutral switch electrical connector. Using ohmmeter, check continuity between switch terminals. Ensure continuity exists with transmission in Neutral. Continuity should not exist with transmission in any other gear. Replace switch as necessary.

Navajo
With ignition switch in OFF position, set DVOM to 200-ohm scale. Locate neutral switch on transmission. Disconnect neutral switch electrical connector. Using ohmmeter, measure resistance across neutral terminals. If resistance is greater than 5 ohms, replace switch.

OXYGEN (O2) SENSOR

B2200, B2600i, Miata, MPV 2.6L, MX-3, Protege, RX7 & 323
1) Warm engine to operating temperature. Operate engine at idle. Disconnect O2 sensor electrical connector. Connect voltmeter between connector and ground. On B2200, B2600i, MPV 2.6L and MX-3 DOHC, increase engine speed to 4500 RPM until voltmeter indicates about .7 volt. On Miata, MX-3 SOHC, Protege, RX7 and 323, increase engine speed to 3000 RPM until voltmeter indicates about .55 volt.
2) Observe voltmeter while rapidly accelerating and decelerating engine speed. Voltage should be 0.5-1.0 volt during acceleration and 0.0-0.4 volt during deceleration. Replace O2 sensor as necessary.

MPV 3.0L, MX-6, 626 & 929
1) Warm engine to operating temperature. Operate engine at idle. Disconnect O2 sensor electrical connector. Connect voltmeter between O2 sensor connector terminals "C" and "D" on MX-6 2.5L and 626 2.5L, or terminals "A" and "B" on all others. See Fig. 39.
2) Observe voltmeter while rapidly accelerating and decelerating engine speed. Voltage should be 0.5-1.0 volt during acceleration and 0.0-0.4 volt during deceleration. Replace O2 sensor as necessary.

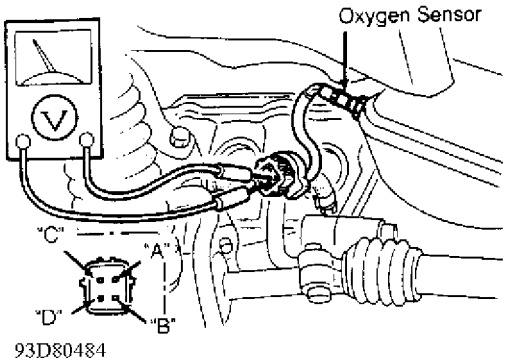


Fig. 39: Testing Oxygen Sensor (MPV 3.0L, MX-6, 626 & 929)
Courtesy of Mazda Motors Corp.

POWER STEERING PRESSURE SWITCH (PSPS)

Disconnect power steering pressure switch electrical connector. Connect ohmmeter to PSPS terminals. Start engine, and operate it at idle. Turn steering wheel from side to side, and observe ohmmeter. Ohmmeter should indicate continuity when front wheels are turned. Continuity should not exist when wheels are not turned. Replace switch as necessary.

THROTTLE POSITION SENSOR

See D - ADJUSTMENTS article for checking and adjustment procedures.

VARIABLE RELUCTANCE (VR) SENSOR

Navajo
See appropriate article below:

F - BASIC TESTING
G - TESTS W/CODES

VEHICLE SPEED SENSOR (VSS)

Except Navajo & 929
See J - PIN VOLTAGE CHARTS article.

Navajo
Disconnect VSS electrical connector on transmission. Using DVOM, measure resistance across VSS terminals. Resistance should be 190-250 ohms. Replace sensor as necessary.

929
1) Connect positive lead of voltmeter to Green/Red wire of combination meter. Connect negative lead of voltmeter to ground. Raise and support rear wheels. Start engine. Engage Drive and rotate rear wheels. Voltmeter should show 3-4 volts. If not, stop engine.
2) Disconnect connector from combination meter. Measure

resistance across Blue/White and Blue/Yellow wires (terminals 1K and 1L). Resistance should be 290 ohms. If resistance is not 290 ohms, check wiring to transmission. If wiring is okay, check resistance of VSS at transmission.

3) If resistance of VSS is not 290 ohms, replace VSS. If resistance of VSS is 290 ohms, replace VSS buffer in instrument cluster.

1-2 SWITCH

RX7 (M/T)

1) Disconnect 1-2 switch connector at transmission. Check continuity across White and Yellow wires. In first gear, no continuity should exist. In all other gears, continuity should be present. If switch does not test as described, replace 1-2 switch.

2) Check continuity across Red and Blue wires. In second gear, continuity should be present. In all other gears, no continuity should exist. If switch does not test as described, replace 1-2 switch.

RELAYS & SOLENOIDS

RELAYS

Circuit Opening Relay

See FUEL PRESSURE (FUEL INJECTION) under FUEL SYSTEM in F - BASIC TESTING article.

Cold Start Injector Relay (929)

Remove cold start injector relay. Apply battery voltage to terminal "C", and ground terminal "D". Continuity should be present with battery voltage applied. Continuity should not exist without voltage applied. Replace relay as necessary.

Fuel Pump Relay (Navajo)

Remove relay from vehicle. Connect battery voltage to terminal "C". See Fig. 40. Ground terminal "D". Check continuity between terminals "A" and "B". Continuity should exists with power applied. Continuity should not exist with power removed.

NOTE: For additional testing, see CIRCUIT TEST J in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

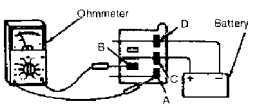
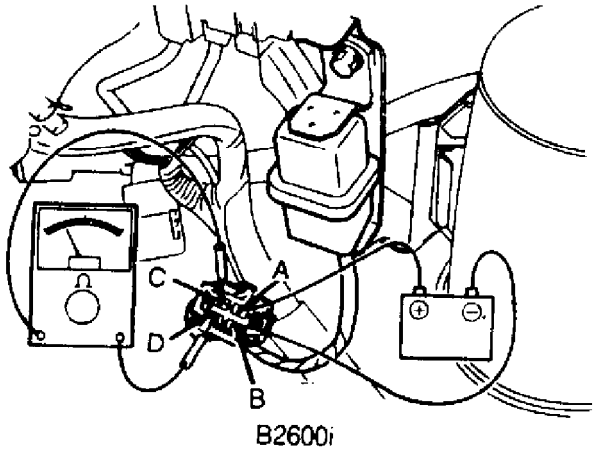


Fig. 40: Testing EEC Power & Fuel Pump Relays (Navajo)
Courtesy of Mazda Motors Corp.

Main Relay (Except Navajo)
1) Ensure main relay clicks when ignition is turned on and off.
2) If no sound is heard, unplug relay. Apply 12 volts to terminal "A", and ground terminal "B". See Fig. 41, 42 or 43.
3) Using ohmmeter, check continuity between terminals "C" and "D". Continuity should be present with 12 volts applied. Continuity should not exist with no voltage applied. Replace main relay as necessary.

EEC Power Relay (Navajo)
Remove relay from vehicle. Connect battery voltage to terminal "C". See Fig. 40. Ground terminal "D". Measure resistance between terminals "A" and "B". Resistance should be less than one ohm with power applied. Continuity should not exist with power removed.

NOTE: For additional testing, see CIRCUIT TEST B in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.



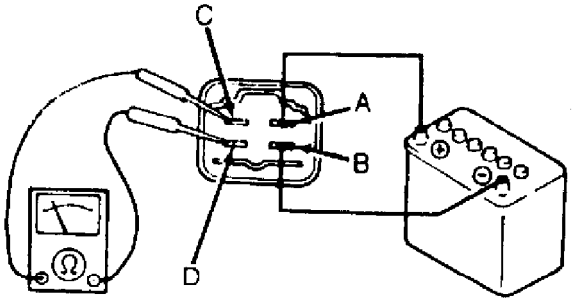
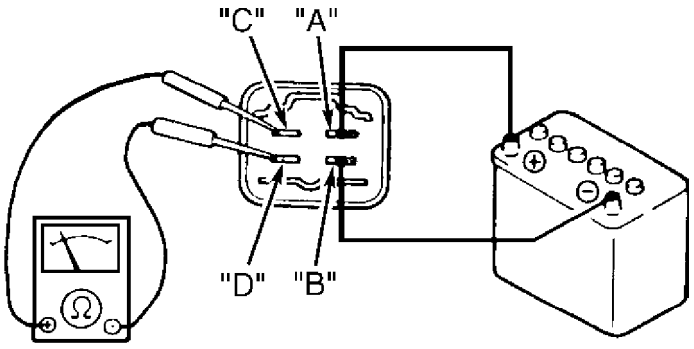
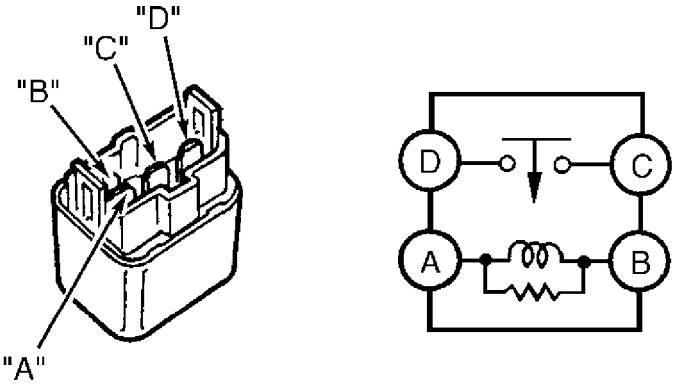


Fig. 41: Testing Main Relay (B2200 & B2600i)
Courtesy of Mazda Motors Corp.



95G31688
Fig. 42: Testing Main Relay (Miata, MPV, MX-3 DOHC, MX-6, Protege, RX7, 323, 626 & 929)
Courtesy of Mazda Motors Corp.



92J24991
Fig. 43: Identifying Main Relay Terminals (MX-3 SOHC)
Courtesy of Mazda Motors Corp.

SOLENOIDS

NOTE: All solenoids (used on all vehicles except Navajo) operate the same way. See Fig. 44 to locate specific solenoids used on RX7.

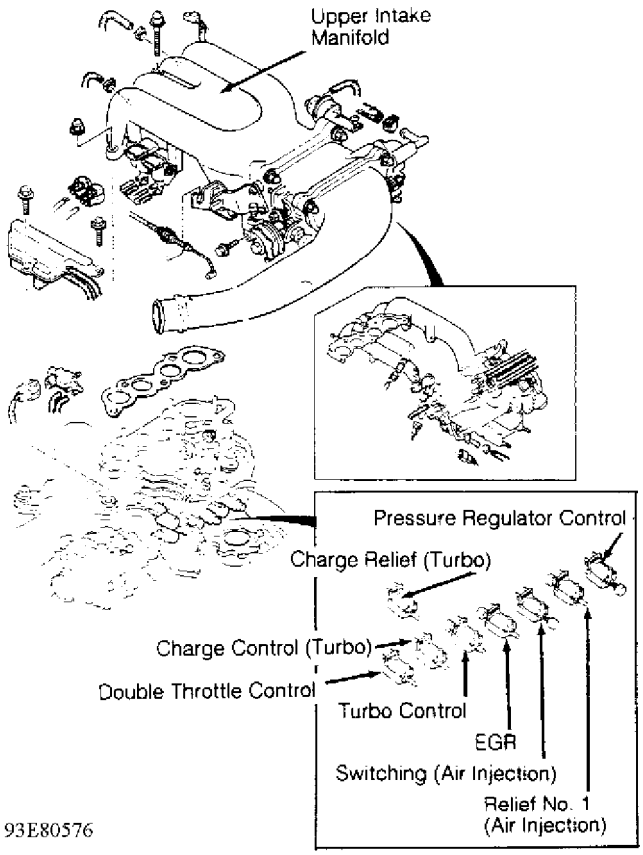


Fig. 44: Locating Vacuum Solenoids (RX7)
Courtesy of Mazda Motors Corp.

Backpressure EGR Vacuum Regulator Valve (Navajo)
See EXHAUST GAS RECIRCULATION (EGR) (NAVAJO - CALIFORNIA) under EMISSION SYSTEMS & SUB-SYSTEMS.

Canister Purge (CANP) Solenoid (Navajo)
See FUEL EVAPORATION (NAVAJO) under EMISSION SYSTEMS & SUB-SYSTEMS.

Cold Start Injector Resistance (929)
Disconnect cold start injector electrical connector. Using ohmmeter, measure resistance between injector terminals. Resistance should be 2.7-3.4 ohms at 68øF (20øC). Replace injector as necessary.

Double Throttle Control Solenoid (RX7)
Disconnect vacuum hose from double throttle control solenoid. Blow air through solenoid port "A". See Fig. 45. Ensure air flows through port "B". Disconnect solenoid valve electrical connector. Connect 12 volts and ground to solenoid terminals. Blow air through solenoid port "A". Air should flow through valve air filter. Replace solenoid as necessary.

EGR Solenoid (MX-3 DOHC, MX-6, RX7, 626 & 929)
See EXHAUST GAS RECIRCULATION (EGR) (MX-3 DOHC, MX-6, RX7, 626 & 929) under EMISSION SYSTEMS & SUB-SYSTEMS.

Fuel Injectors
Using stethoscope, listen for normal clicking sound at each injector during idle and acceleration. If clicking sound is not heard, check injector wiring circuit, or main relay and circuit.

Fuel Injector Resistance
Disconnect fuel injector electrical connector. Using ohmmeter, measure resistance between injector terminals. Resistance should be 12-16 ohms. Replace injector as necessary.

Pressure Regulator Control Solenoid (Except Navajo)
Disconnect vacuum hose from pressure regulator control solenoid. Blow air through solenoid port "A". See Fig. 45. Ensure air flows through port "B". Disconnect solenoid valve electrical connector. Connect 12 volts and ground to solenoid terminals. Blow air through solenoid port "A". Air should flow through valve air filter. Replace solenoid as necessary.

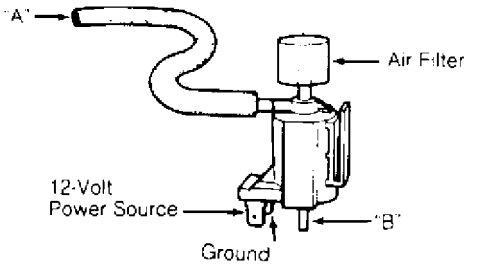


Fig. 45: Testing Pressure Regulator Control Solenoid
Courtesy of Mazda Motors Corp.

Purge Control Solenoid
See FUEL EVAPORATION (EXCEPT NAVAJO) under EMISSION SYSTEMS & SUB-SYSTEMS.

Air Injection Solenoid (RX7)
See AIR INJECTION (RX7) under EMISSION SYSTEMS & SUB-SYSTEMS.

Turbocharger Solenoid (RX7)
See TURBOCHARGER (RX7) under AIR INDUCTION SYSTEMS.

VICS Solenoid (Protege DOHC & 929)
See VARIABLE INERTIA CHARGING SYSTEM (PROTEGE DOHC & 929) under AIR INDUCTION SYSTEMS.

VRIS Solenoid (MPV 3.0L, MX-3 DOHC, MX-6 2.5L & 626 2.5L)
See VARIABLE RESONANCE INDUCTION SYSTEM (MPV 3.0L, MX-3 DOHC, MX-6 2.5L & 626 2.5L) under AIR INDUCTION SYSTEMS.

FUEL SYSTEM

FUEL DELIVERY

NOTE: For fuel system pressure testing, see F - BASIC TESTING article.

Circuit Opening Relay
See FUEL PRESSURE (FUEL INJECTION) under FUEL SYSTEM in F - BASIC TESTING article.

Fuel Pump Circuit
See FUEL PRESSURE (FUEL INJECTION) under FUEL SYSTEM in F - BASIC TESTING article.

Fuel Pump Relay (Navajo)
See FUEL PUMP RELAY (NAVAJO) under RELAYS under RELAYS & SOLENOIDS. Also see FUEL PRESSURE (FUEL INJECTION) under FUEL SYSTEM in F - BASIC TESTING article.

Inertia Fuel Shutoff (IFS) Switch (Navajo)
See INERTIA FUEL SHUTOFF (IFS) SWITCH under ENGINE SENSORS & SWITCHES. Also see FUEL PRESSURE (FUEL INJECTION) under FUEL SYSTEM in F - BASIC TESTING article.

Fuel Pressure Regulator (Except Navajo)
See FUEL PRESSURE (FUEL INJECTION) under FUEL SYSTEM in F - BASIC TESTING article.

Fuel Pressure Regulator (Navajo)
1) Ensure ignition is off. Connect fuel pressure gauge to Schrader valve on fuel rail. Ensure manifold vacuum supply tube is connected to fuel pressure regulator. Start engine, and run it for 10 seconds. Stop engine, and wait 10 seconds. Start engine, and operate it for 10 seconds. Stop engine, and remove pressure regulator vacuum hose. See Fig. 46. Check vacuum port for fuel.

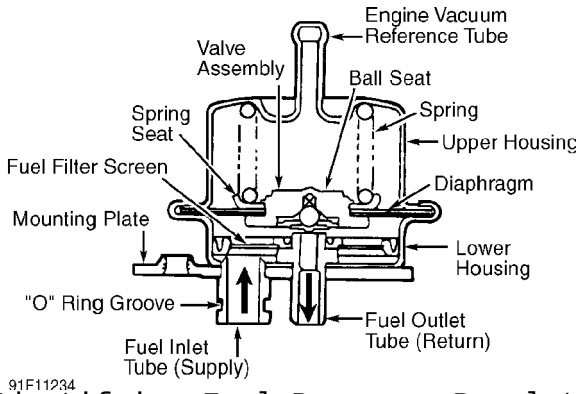


Fig. 46: Identifying Fuel Pressure Regulator Components (Navajo)
Courtesy of Ford Motor Co.

2) If fuel is present, replace fuel pressure regulator and repeat test. If fuel is not present, plug pressure regulator vacuum hose. Observe fuel pressure while driving vehicle and accelerating heavily. If fuel pressure remains at 27-48 psi, go to next step. If fuel pressure does not remain at 27-48 psi, check fuel filter. If filter is okay, replace fuel pump. If filter is dirty, replace filter and recheck system.

3) Remove plug from vacuum hose, and connect hose to pressure regulator. Install vacuum gauge to intake manifold. Start engine, and observe fuel pressure gauge and vacuum gauge readings. Increase engine speed. Fuel pressure gauge reading should increase as vacuum gauge reading decreases and vacuum gauge reading should increase as fuel pressure gauge decreases.

4) If gauges responds as specified, no fault is present in fuel system. Check for other causes of driveability symptoms. If gauges do not respond as specified, turn ignition off. Remove vacuum hose from fuel pressure regulator, and plug hose. Install a vacuum pump to pressure regulator. Start engine, and observe fuel pressure. Apply vacuum.

5) If fuel pressure changes as vacuum is applied, check and repair vacuum system. If fuel pressure does not change as vacuum is applied, replace fuel pressure regulator.

Fuel Pressure Regulator Pressure Leakage (Navajo)

1) Ensure ignition is off. Relieve fuel pressure. See FUEL SYSTEM in F - BASIC TESTING article. Remove fuel pressure regulator. Check "O" ring, gasket and mounting surfaces for cracks, cuts and other damage.

2) Connect vacuum pump to fuel return tube, and apply 20 in. Hg vacuum. See Fig. 46. If maximum vacuum loss exceeds 10 in. Hg in 10 seconds, replace fuel pressure regulator. If maximum vacuum loss does not exceed 10 in. Hg in 10 seconds, fuel pressure regulator is functioning properly.

Pulsation Damper (Navajo & RX7)

Start engine, and allow it to idle. Pulsation damper is located at end of fuel rail. Place finger over pulsation damper and ensure damper pulsates. Replace pulsation damper as necessary.

Pressure Regulator Control (Except Miata, Navajo & 929)

1) Engine must be at or near operating temperature. Turn engine off. Disconnect vacuum hose at fuel pressure regulator and connect a vacuum gauge to hose.

2) Without touching throttle, start engine. Observe vacuum gauge. Vacuum should not exist. If vacuum is present, check pressure regulator control solenoid and related circuits. If no vacuum exists, count seconds until vacuum gauge shows intake manifold vacuum. See PRESSURE REGULATOR SPECIFICATIONS table.

3) If vacuum gauge shows intake manifold vacuum after specified amount of time, system is okay. See Fig. 47. If intake manifold vacuum is not present, check vacuum source, pressure regulator control solenoid and related circuits.

Pressure Regulator Control Solenoid (Except Navajo)

See PRESSURE REGULATOR CONTROL SOLENOID (EXCEPT NAVAJO) under SOLENOIDS under RELAYS & SOLENOIDS.

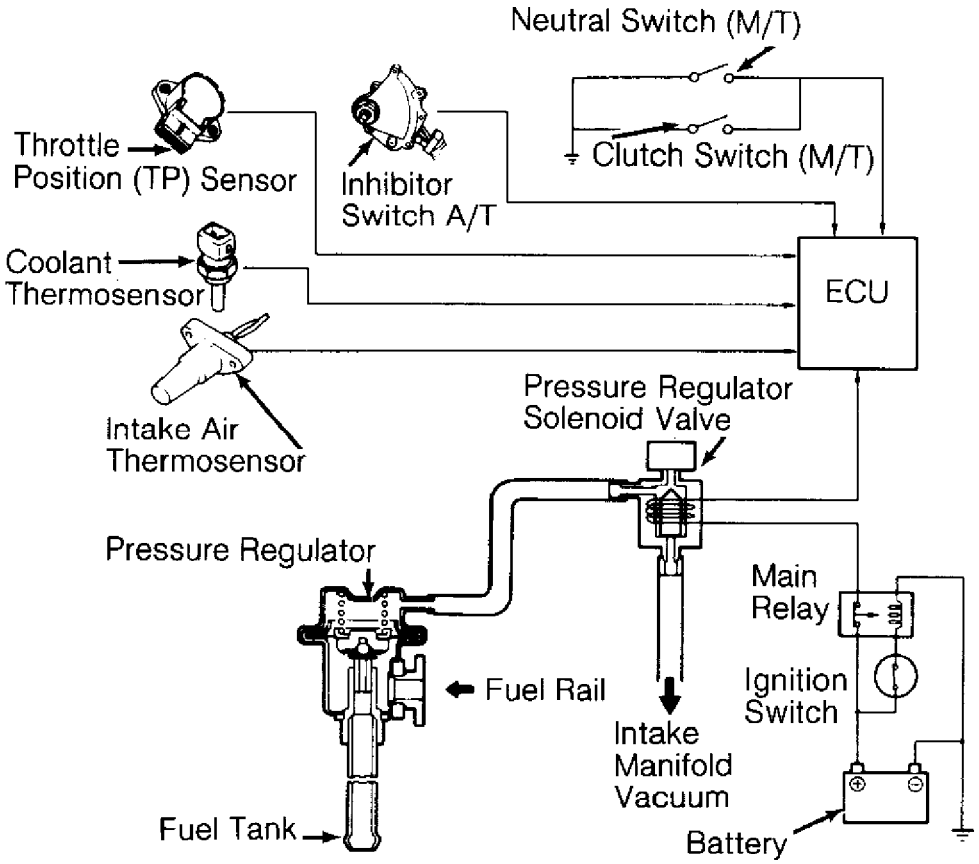


Fig. 47: Typical Pressure Regulator Control System (Except Miata, Navajo & 929)
Courtesy of Mazda Motors Corp.

PRESSURE REGULATOR SPECIFICATION TABLE

Application	Operating Time (sec.)
B2200 & 2600i	120
MPV	
2.6L	240
3.0L	120
MX-3	120
MX-6 & 626	
2.0L	10
2.5L	120
Protege & 323	
1.6L & 1.8L DOHC	60
1.8L SOHC	120

FUEL CONTROL

Fuel Injectors
See FUEL INJECTORS under SOLENOIDS under RELAYS & SOLENOIDS.

Injector Fuel Leakage (Except Navajo)
1) Relieve fuel system pressure. See F - BASIC TESTING article. Remove air valve or dynamic chamber as necessary. Remove delivery pipe with hoses still connected. Remove fuel injectors. Using wire, secure injectors tightly onto delivery pipe.

CAUTION: Ensure injectors are securely tied to delivery pipe. If injectors are not properly secured to delivery pipe, fuel may spray from loose connections.

2) On Miata, MX-3, MX-6, Protege, RX7, 323, 626 and 929, connect a jumper wire between terminals F/P and GND of diagnostic connector located near battery. See Fig. 48.
3) On B2200, B2600i and MPV, install a jumper wire between terminals of Yellow fuel pump check connector. Fuel pump check connector is located on firewall, under windshield wiper motor.
4) Turn ignition on for 10 seconds. Turn ignition off, and clean injector nozzles. On 4-cylinder models, tilt injectors about 60 degrees. On all models, turn ignition on. Ensure no fuel leakage exists at injectors. After one minute, a single drop of fuel is acceptable. If fuel leakage is present, replace faulty injector.

Injector Fuel Leakage (Navajo)
Use fuel injector tester/cleaner to test injector fuel leakage. Testing procedures are provided in instructions included with tester/cleaner from manufacturer.

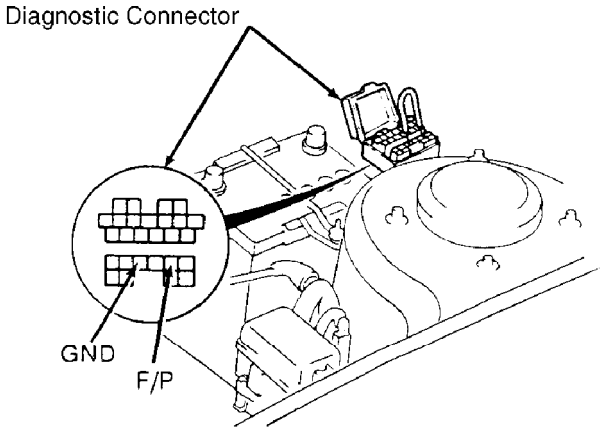


Fig. 48: Diagnostic Connector Terminal ID (Miata, MX-3, MX-6, Protege, RX7, 323, 626 & 929)
Courtesy of Mazda Motors Corp.

IDLE CONTROL SYSTEM

IDLE SPEED CONTROL (ISC) SYSTEM (B2200, B2600i, MPV, MX-3, MX-6, 626 & 929)

Air Valve (B2200, B2600i, MPV 2.6L, MX-6 2.0L & 626 2.0L)

1) Remove air valve from throttle body. Blow air through valve from port "A" and ensure air comes out of port "B" when valve is cold. See Fig. 49.

2) Place air valve in water at temperature greater than 176øF (80øC) for one minute. Blow air through valve from port "A". No air should come out of port "B". Replace valve as necessary.

Air Valve (MPV 3.0L & 929)

1) Disconnect air hoses from air valve. Blow air through valve from port "A" and ensure air flows through valve when engine is cold. See Fig. 50.

2) Warm engine to normal operating temperature. Blow air through valve from port "A". Air should not flow through valve. Replace valve as necessary.

Air Valve System (MX-3, MX-6 & 626)

Connect jumper wire between diagnostic connector terminals TEN and GND. Connect tachometer to diagnostic connector terminal IG. See Fig. 51. Start engine. Idle speed should decrease as engine reaches normal operating temperature. Replace valve as necessary.

ISC Valve

Disconnect ISC valve electrical connector. Connect ohmmeter to ISC valve 2-wire connector. Measure resistance. See ISC RESISTANCE SPECIFICATIONS table. If resistance is not within specification, replace ISC valve.

ISC RESISTANCE SPECIFICATIONS TABLE

Application	Testing Temperature øF (øC)	Ohms
B2200, B2600i, MX-6 2.0L, MPV 2.6L & 626 2.0L	73 (23)	7.7-9.3
MPV 3.0L, MX-3, MX-6 2.5L, 626 2.5L & 929	68 (20)	10.7-12.3

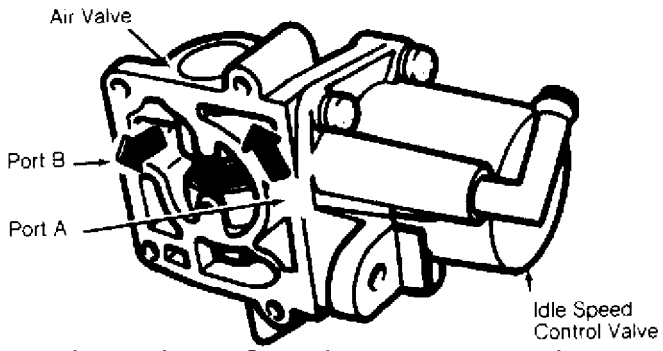


Fig. 49: Testing Air Valve (B2200, B2600i, MPV 2.6L, MX-6 & 626)
Courtesy of Mazda Motors Corp.

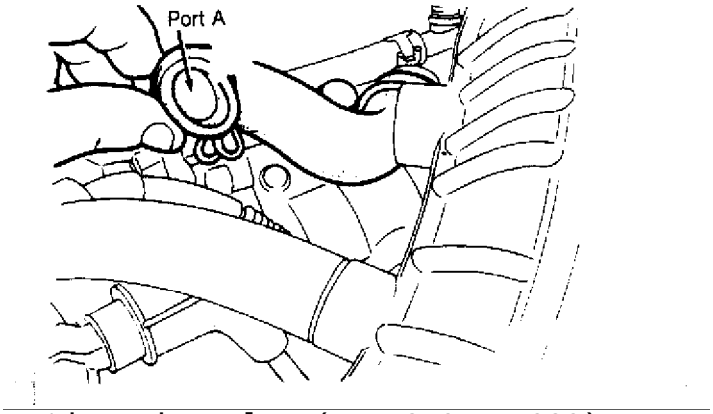


Fig. 50: Testing Air Valve (MPV 3.0L & 929)
Courtesy of Mazda Motors Corp.

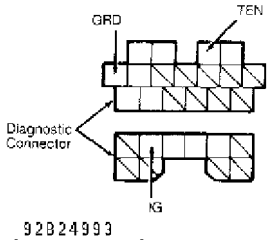


Fig. 51: Diagnostic Connector Terminal ID (MX-3, MX-6 & 626)
Courtesy of Mazda Motors Corp.

IDLE SPEED CONTROL (ISC) SYSTEM (MIATA, PROTEGE & 323)

Air Valve

Remove air valve. Cool air valve to temperature less than 32øF (0øC). Using a drier, heat air valve and verify plunger moves in direction of arrow. See Fig. 52.

ISC Valve

Disconnect ISC valve electrical connector. Connect ohmmeter to Idle Speed Control (ISC) valve 2-wire connector. Measure resistance. Resistance should be 11-13 ohms at 68øF (20øC). If resistance is not within specification, replace ISC valve.

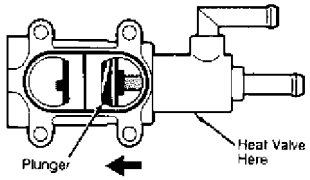


Fig. 52: Cross-Sectional View Of Air Valve (Miata, Protege & 323)
Courtesy of Mazda Motors Corp.

IDLE SPEED CONTROL (ISC) SYSTEM (NAVAJO)

Idle Speed Control (ISC) Solenoid

1) Solenoid is a by-pass air-type solenoid. Disconnect coolant hoses. Make sure coolant flows through ISC and air valve is open at room temperature.

2) Ensure ignition is off. Disconnect ISC solenoid electrical connector. Set DVOM to 200-ohm scale. Measure resistance between ISC solenoid terminals. A diode is located in solenoid; connect DVOM positive test lead to VPWR terminal (Red wire) and negative lead to ISC terminal (White/Light Blue wire). Resistance should be 6-13 ohms. Replace solenoid as necessary.

IDLE SPEED CONTROL (ISC) SYSTEM (RX7)

ISC Valve

1) Make sure fast idle cam has released throttle lever. See Fig. 53. Disconnect ISC valve electrical connector. Connect ohmmeter to ISC valve 2-wire connector. See Fig. 54. Measure resistance. Resistance should be 10.7-12.3 ohms at 68øF (20øC). If resistance is not within specification, replace ISC valve.

2) With engine idling at operating temperature, disconnect ISC valve electrical connector. Engine speed should increase to 1000-1500 RPM. If engine speed does not increase, replace ISC valve.

Accelerated Warm-Up System (AWS) Valve

Make sure fast idle cam has released throttle lever. See Fig. 53. Disconnect AWS valve electrical connector. Connect ohmmeter to AWS valve 2-wire connector. See Fig. 55. Measure resistance. Resistance should be 9.3-11.3 ohms at 68øF (20øC). If resistance is not within specification, replace AWS valve.

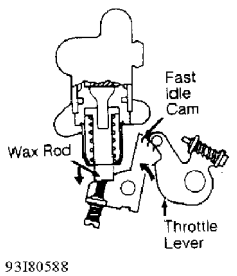


Fig. 53: Checking Fast Idle Cam & Throttle Lever
Courtesy of Mazda Motors Corp.

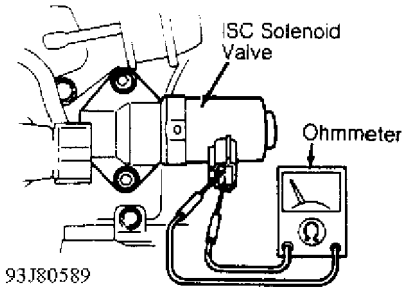


Fig. 54: Checking ISC Solenoid Valve
Courtesy of Mazda Motors Corp.

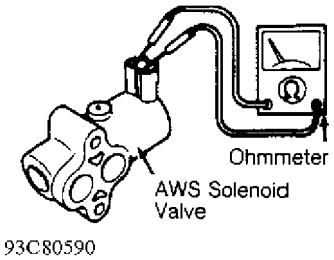


Fig. 55: Checking AWS Solenoid Valve
Courtesy of Mazda Motors Corp.

IGNITION SYSTEM

* PLEASE READ THIS FIRST *

NOTE: For basic ignition checks, see F - BASIC TESTING article.

PINPOINT TESTS (NAVAJO)

NOTE: Before testing Electronic Distributorless Ignition System (EDIS), ensure all tests in F - BASIC TESTING and G - TESTS W/CODES articles have been performed. In following tests, Electronic Distributorless Ignition System (EDIS) or Ignition Control Module (ICM) may be used to describe ignition system.

NOTE: Use EDIS Diagnostic Cable (49-UN01-057) to diagnose system. Cable is equipped with additional circuits and components to enhance and modify signals for testing purposes. If using an aftermarket test cable or DVOM, become familiar with system wiring diagram and system operation. See Figs. 56 and 57.

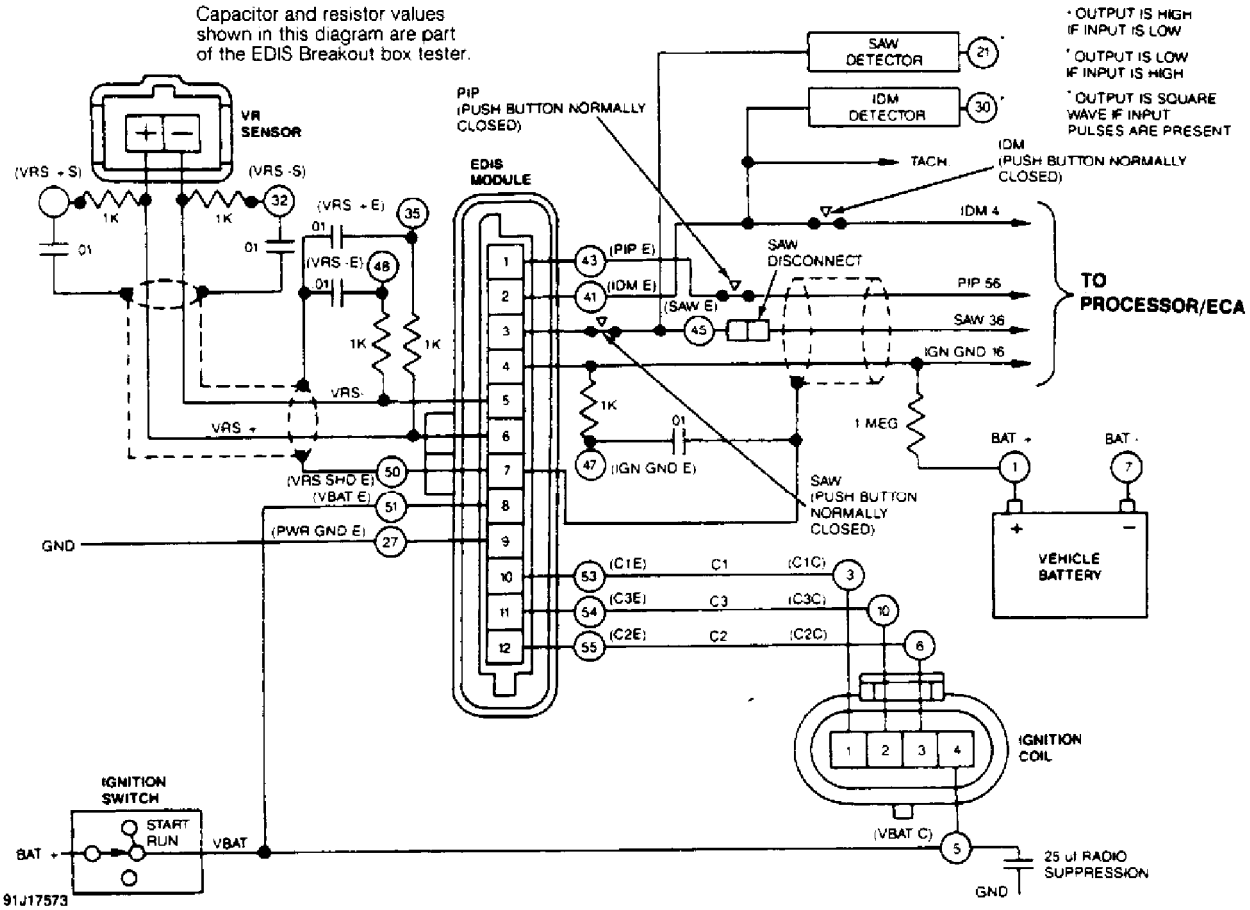


Fig. 56: Ignition System Wiring Diagram (Navajo)
Courtesy of Mazda Motors Corp.

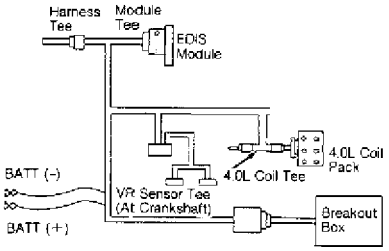


Fig. 57: EDIS/ICM Diagnostic Cable Diagram (Navajo)
Courtesy of Mazda Motors Corp.

CAUTION: Unless directed otherwise, DO NOT connect PCM to Breakout Box (BOB) when performing ICM diagnostics.

Pinpoint Test B (IDM Failure Code 212)
1) With ignition off, connect ICM diagnostic cable to Breakout Box (BOB) and ICM module. DO NOT connect VR sensor tee or coil tee. Use ICM "6" overlay. Connect negative and positive leads of

ICM diagnostic cable to battery. Set ICM diagnostic cable box switch to 4/6 CYLINDER position. Set DVOM on 20-volt AC scale. Start engine. Measure voltage between IDM DETECTOR (30) and BAT- (7) of diagnostic cable Ignition Diagnostic Monitor (IDM) at BOB. If pulses are present, IDM detector output will be 5-7 volts AC. If AC voltage is 5-7 volts, go to next step. If AC voltage is not 5-7 volts, go to step 3).

2) With ignition off, ICM module and PCM disconnected, disconnect ICM module from ICM module tee, leaving ICM diagnostic cable connected to vehicle harness connector. Set DVOM on 200-ohm scale. Connect PCM Breakout Box (BOB) to PCM harness connector. Measure resistance between IDM E (41) at BOB and terminal No. 4 at PCM BOB. If resistance is less than 5 ohms, IDM signal at PCM is okay. PCM does not respond to IDM signal. Replace PCM. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section. If resistance is 5 ohms or more, IDM is open. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in appropriate G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

3) With ignition off and IDM circuit disconnected, set DVOM on 20-volt AC scale. Push ICM IDM button at ICM diagnostic cable connector to BOB. Start engine, and measure voltage between diagnostic cable IDM DETECTOR (30) and BAT- (7) at BOB. If AC voltage is 5-7 volts, go to next step. If AC voltage is not 5-7 volts, IDM output from ICM module does not exist. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

4) With ignition off and PCM disconnected, set DVOM on 20-volt AC scale. Crank engine, and measure voltage between diagnostic cable IDM DETECTOR (30) and BAT- (7) at BOB. If voltage is less than 5 volts, go to next step. If voltage is 5 volts or more, PCM is loading IDM signal. Replace PCM. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

5) With ignition off and ICM module and PCM disconnected, disconnect ICM module from diagnostic cable module tee, leaving ICM diagnostic cable connected to vehicle harness connector. Set DVOM on 20-k/ohm scale. Measure resistance between IDM E (41) and BAT- (7) at BOB. If resistance is 10-k/ohms or more, go to next step. If resistance is less than 10-k/ohms, IDM is shorted low. Check connections and/or repair short circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

6) With ignition off and ICM module and PCM disconnected, set DVOM on 20-volt DC scale. With Key On Engine Off (KOEO), measure voltage between IDM E (41) and BAT- (7) at BOB. If DC voltage is .5 volt or more, IDM is shorted high. Check connections and/or repair short circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST.

See QUICK TEST in G - TESTS W/CODES article.

7) If voltage is less than .5 volt, IDM is shorted to another wire between ICM module and PCM. Check connections and/or repair short circuit or replace harness. Remove test equipment and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

CAUTION: Unless directed otherwise, DO NOT connect PCM to Breakout Box (BOB) when performing ICM diagnostics.

Pinpoint Test C (Lack Of Power Or Poor Fuel Economy Code 213)

1) With ignition off, install ICM diagnostic cable to BOB and ICM module. DO NOT connect VR sensor tee or coil tee. Use ICM 6 overlay. Connect negative and positive leads of ICM diagnostic cable to battery. Set ICM diagnostic cable box switch to 4/6 CYLINDER position. Connect timing light (must be ICM compatible). Start engine, and warm it to normal operating temperature. Push and hold down ICM diagnostic cable SAW detector button. If timing is 8-12 degrees BTDC, go to next step. If timing is not 8-12 degrees BTDC, go to step 8).

2) Release ICM diagnostic cable SAW detector button. Go to next step if timing is not 15 degrees BTDC. If timing is more than 15 degrees BTDC, ICM is okay. Check for other causes of driveability symptoms.

3) With ignition off, set DVOM on 20-volt AC scale. Start engine and measure voltage between SAW DETECTOR (21) of ICM diagnostic cable and BAT- (7) at BOB. If AC voltage is 5 volts or more, go to next step. If AC voltage is less than 5 volts, SAW input to ICM module is okay and no spark advance is present. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

4) With ignition off and SAW circuit disconnected, set DVOM on 20-volt AC scale. Push and hold down SAW detector button at ICM diagnostic cable connector to BOB. Start engine, and measure voltage between SAW DETECTOR (21) of ICM diagnostic cable and BAT- (7) at BOB. If AC voltage is less than 5 volts, go to next step. If AC voltage is 5 volts or more, SAW is shorted in ICM module. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

5) With ignition off and ICM module and PCM disconnected, disconnect ICM module from ICM module tee, leaving ICM diagnostic cable connected to vehicle harness connector. Set DVOM on 20-k/ohm scale. Disconnect ICM diagnostic cable positive lead to battery. Measure resistance between SAW E (45) and BAT- (7) at BOB. If resistance is 10 k/ohms or more, go to next step. If resistance is less than 10 k/ohms, SAW is shorted low. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

6) With ignition off and ICM module and PCM disconnected, set

DVOM on 20-volt DC scale. With Key On Engine Off (KOEO), measure voltage between SAW E (45) and BAT- (7) at BOB. If DC voltage is less than .5 volt, go to next step. If DC voltage is .5 volt or more, SAW is shorted high. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

7) With ignition off and ICM module and PCM disconnected, set DVOM on 200-ohm scale. Connect PCM Breakout Box (BOB) to PCM harness connector. Measure resistance between SAW E (45) at BOB and terminal No. 36 at PCM BOB. If resistance is less than 5 ohms, SAW is open. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in appropriate G - TESTS W/CODES article. If resistance is 5 ohms or more, SAW is not being transmitted by ECU. Replace ECU. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

8) If VR sensor or trigger wheel is loose, misaligned or damaged, repair or replace as necessary. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section. If VR sensor or trigger wheel is not loose, misaligned or damaged, ICM module has incorrect output. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

CAUTION: Unless directed otherwise, DO NOT connect PCM to PCM Breakout Box (BOB) when performing ICM diagnostics.

Pinpoint Test D (No Start Or Coil Failure Code 232)

1) Using spark plug tester, check for spark at all spark plug wires while cranking. If spark was consistent on all spark plug wires (one spark per crankshaft revolution), ignition system is okay. Check for other causes of driveability symptoms. If spark was not consistent on all spark plug wires, check spark plug wires for insulation damage, looseness, shorting and other damage. Remove and check spark plugs for wear, carbon deposits, improper gap and damage. If spark plugs and wires are okay, go to next step. If spark plugs and wires are not okay, repair or replace as necessary. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

2) With ignition off, install ICM diagnostic cable to BOB. Connect ICM diagnostic cable negative lead to battery. Set ICM diagnostic cable box switch to 4/6 CYLINDER position. Install coil tee. Use ICM "6" overlay. Set DVOM on 20-volt DC scale. With Key On, Engine Off (KOEO), measure voltage between VBAT C (5) and BAT- (7) at BOB. If DC voltage is 10 volts or more, go to next step. If DC voltage is less than 10 volts, VBAT is open. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST.

See QUICK TEST in G - TESTS W/CODES article.

3) With Key On Engine Off (KOEO), measure voltage between C1C (3) and BAT- (7) at BOB. If DC voltage is 10 volts or more, go to next step. If DC voltage is less than 10 volts, go to step 15).

4) With Key On Engine Off (KOEO), measure voltage between C2C (6) and BAT- (7) at BOB. If DC voltage is 10 volts or more, go to next step. If DC voltage is less than 10 volts, go to step 17).

5) With Key On Engine Off (KOEO), measure voltage between C3C (6) and BAT- (7) at BOB. If DC voltage is 10 volts or more, go to next step. If DC voltage is less than 10 volts, go to step 19).

6) With ignition off, connect ICM module tee to ICM module and vehicle harness connector. Set DVOM on 20-volt DC scale. With KOEO, measure voltage between C1E (53) and BAT- (7) at BOB. If DC voltage is 10 volts or more, go to next step. If DC voltage is less than 10 volts, C1 is open. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

7) With KOEO, measure voltage between C2E (55) and BAT- (7) at BOB. If DC voltage is 10 volts or more, go to next step. If DC voltage is less than 10 volts, C2 is open. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

8) With KOEO, measure voltage between C3E (54) and BAT- (7) at BOB. If DC voltage is 10 volts or more, go to next step. If DC voltage is less than 10 volts, C3 is open. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

9) With ignition off and coil disconnected, disconnect coil pack from coil tee. Leave ICM diagnostic cable connected to vehicle harness connector. Set DVOM on 20-volt DC scale. With KOEO, measure voltage between C1C (3) and BAT- (7) at BOB. If voltage is less than .5 volt, go to next step. If voltage is .5 volt or more, go to step 21).

10) With KOEO and coil disconnected, measure voltage at BOB between C2C (6) and BAT- (7). If DC voltage is less than .5 volt, go to next step. If DC voltage is .5 volt or more, go to step 22).

11) With KOEO and coil disconnected, measure voltage at BOB between C3C (10) and BAT- (7). If DC voltage is less than 10.5 volts, go to next step. If DC voltage is 10.5 volts or more, go to step 23).

12) With coil disconnected, connect ICM diagnostic cable positive lead to battery. Connect incandescent test light between C1C (3) and BAT+ (1). Crank engine. If test light blinks consistently and brightly (one blink per engine revolution), go to next step. If test light does not blink consistently and brightly, C1 is open in ICM module. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

13) With coil disconnected, connect incandescent test light between C2C (6) and BAT+ (1). Crank engine. If test light blinks consistently and brightly (one blink per engine revolution), go to next step. If test light does not blink consistently and brightly, C2 is open in ICM module. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

14) With coil disconnected, connect incandescent test light between C3C (10) and BAT+ (1). Crank engine. If test light blinks consistently and brightly (one blink per engine revolution), input to coil pack is okay and no high voltage output is present. Replace coil pack. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article. If test light does not blink consistently and brightly, C3 is open in ICM module. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

15) With ignition off and coil disconnected, set DVOM on 20-k/ohm scale. Disconnect coil from coil tee, leave ICM diagnostic cable connected to vehicle harness connector. Measure voltage at BOB between C1C (3) and BAT- (7). If resistance is less than 2 k/ohms, go to next step. If resistance is 2 k/ohms or more, C1 is open in coil. Replace coil pack. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

16) With ignition off and ICM module and coil disconnected, disconnect ICM module from vehicle harness connector. Set DVOM on 20-k/ohm scale. Measure voltage between C1C (3) and BAT- (7) at BOB. If resistance is less than 10-k/ohms, C1 is shorted low. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article. If resistance is 10-k/ohms or more, C1 is shorted low. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

17) With ignition off and coil disconnected, set DVOM on 20-k/ohm scale. Disconnect coil from coil tee, leave ICM diagnostic cable connected to vehicle harness connector. Measure resistance between C2C (6) and BAT- (7) at BOB. If resistance is less than 2k/ohms, go to next step. If resistance is 2 k/ohms or more, C2 is open in coil. Replace coil pack. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

18) With ignition off and ICM module and coil disconnected, disconnect ICM module from vehicle harness connector. Set DVOM on 20-k/ohm scale. Measure resistance between C2C (6) and BAT- (7) at BOB. If resistance is less than 10 k/ohms, C2 is shorted low. Check connections and/or repair open circuit or replace harness. Remove test

equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in SELF-DIAGNOSTICS - NAVAJO article. If resistance is 10 k/ohms or more, C2 is shorted low. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

19) With ignition off and coil disconnected, set DVOM on 20-k/ohm scale. Disconnect coil from coil tee, leave ICM diagnostic cable connected to vehicle harness connector. Measure resistance between C3C (10) and BAT- (7) at BOB. If resistance is less than2 k/ohms, go to next step. If resistance is 2 k/ohms or more, C3 is open in coil. Replace coil pack. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

20) With ignition off and ICM module and coil disconnected, disconnect ICM module from vehicle harness connector. Set DVOM on 20-k/ohm scale. Measure resistance between C3C (10) and BAT- (7) at BOB. If resistance is less than 10 k/ohms, C3 is shorted low. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article. If resistance is 10 k/ohms or more, C3 is shorted low. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

21) With ignition off and ICM module and coil disconnected, disconnect ICM module from ICM module tee. Leave ICM diagnostic cable connected to vehicle harness connector. Set DVOM on 20-volt DC scale. With KOEO, measure voltage between C1C (3) and BAT- (7) at BOB. If DC voltage is .5 volt or more, C1 is shorted high. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article. If DC voltage is less than .5 volt, C1 is shorted high. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article.

22) With ignition off and ICM module and coil disconnected, disconnect ICM module from ICM module tee. Leave ICM diagnostic cable connected to vehicle harness connector. Set DVOM on 20-volt DC scale. With KOEO, measure voltage between C2C (6) and BAT- (7) at BOB. If DC voltage is .5 volt or more, C2 is shorted high. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article. If DC voltage is less than .5 volt, C2 is shorted high. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

23) With ignition off and ICM module and coil disconnected, disconnect ICM module from ICM module tee. Leave ICM diagnostic cable

connected to vehicle harness connector. Set DVOM on 20-volt DC scale. With KOEO, measure voltage between C3C (10) and BAT- (7) at BOB. If DC voltage is .5 volt or more, C3 is shorted high. Check connections and/or repair open circuit or replace harness. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article. If DC voltage is less than .5 volt, C3 is shorted high. Replace ICM module. Remove test equipment, and reconnect all components. Clear continuous memory codes, and rerun QUICK TEST. See QUICK TEST in G - TESTS W/CODES article in the ENGINE PERFORMANCE section.

EMISSION SYSTEMS & SUB-SYSTEMS

AIR INJECTION (RX7)

System Inspection

1) Warm engine to normal operating temperature. Disconnect electrical connector from switching valve solenoid. Using jumper wires, energize solenoid.

2) If engine idles rough, air control valve and switching valve solenoid are okay. See Fig. 58. If engine does not idle rough, check vacuum routing, switching valve solenoid, air pump and air control valve.

Air Control Valve

1) Remove air control valve. Apply about 15 in. Hg to switching valve port. See Fig. 59. Ensure switching valve opens. If switching valve does not open, replace air control valve.

2) Apply about 19 in. Hg to air relief valve port. See Fig. 60. Ensure air relief valve opens. If air relief valve does not open, replace air control valve.

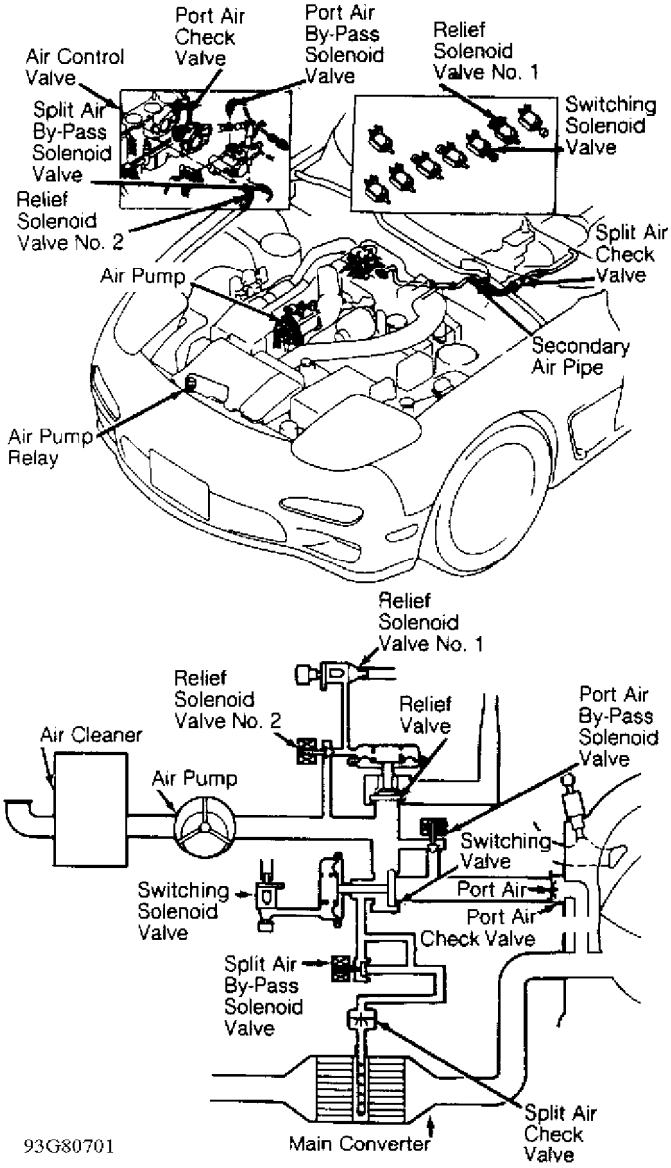


Fig. 58: View Of Air Injection System (RX7)
Courtesy of Mazda Motors Corp.

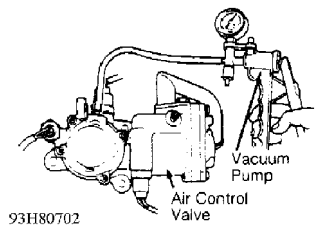


Fig. 59: Testing Switching Valve (RX7)
Courtesy of Mazda Motors Corp.

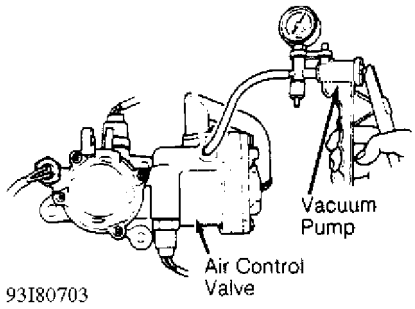


Fig. 60: Testing Air Relief Valve (RX7)
Courtesy of Mazda Motors Corp.

Air Pump

1) Install a "T" fitting into hose between air pump and air control valve. Connect a pressure gauge to fitting. Start engine. Pressure gauge should show at least .7 psi (.05 kg/cmý) coming from air pump. If pressure is less than specified, replace air pump.

2) Increase engine speed to 3250 RPM and verify air pump magnetic clutch disengages. If air pump magnetic clutch does not disengage, disconnect electrical connector from air pump. Air pump magnetic clutch should disengage.

3) If air pump is still engaged, replace air pump. If air pump magnetic clutch disengaged when electrical connector was disconnected, check air pump relay (located in front engine compartment relay box).

Air Relief Valve

1) Warm engine to normal operating temperature. Disconnect hose from air relief valve. Ensure no air flows from hose. If air does flow, air relief valve may be stuck open.

2) Disconnect electrical connector from relief valve solenoid No. 1. Using jumper wires, energize solenoid. If air flows from air relief valve, air relief valve and relief valve solenoid No. 1 are okay. See Fig. 58. If air does not flow, check vacuum routing, relief valve solenoid No. 1, air pump and air control valve.

Control Solenoids

Disconnect electrical connector from each solenoid. See Fig. 58. Using jumper wires, energize solenoid. Ensure each solenoid clicks. Measure resistance across solenoid terminals. Resistance should be 26-33 ohms at room temperature. If any solenoid does not test as described, replace solenoid.

Port Air & Split Air Check Valves

1) Operate engine at idle. Disconnect hose between air pump and air control valve. See Fig. 58. Ensure exhaust gas is not leaking from port air check valve. If exhaust gas is leaking, replace air control valve.

2) Disconnect hose from split air check valve. See Fig. 58. Increase engine speed to 2000 RPM and verify exhaust gas is not

leaking from split air check valve. If valve is not working correctly, replace split air check valve.

DECELERATION CONTROL SYSTEM

NOTE: Deceleration control system is a function of dashpot and ECU. Dashpot prevents sudden closure of throttle valve. ECU controls fuel cut during deceleration. For adjustment and testing, see D - ADJUSTMENTS article.

EXHAUST GAS RECIRCULATION (EGR) (MX-3 DOHC, MX-6, RX7, 626 & 929)

System Check (MX-3 DOHC, MX-6 2.5L, 626 2.5L & 929)

1) Connect Engine Signal Monitor (49-9200-162) and Test Harness (49 G018 903) to ECU. Start engine. Increase engine speed, and check voltage at ECU terminals 3O and 3P while engine is cold. See PIN VOLTAGE CHARTS article. Voltage should be 12 volts.

2) Warm engine to operating temperature, and operate it at idle. Increase engine speed, and ensure engine signal monitor Green and Red lights flash at ECU terminals 3O and 3P.

3) Disconnect EGR solenoid valve (vacuum side) electrical connector. Apply 12 volts and a ground to solenoid valve. Ensure engine runs rough or stalls at idle. Test EGR components as necessary. See Fig. 61 or 63.

System Check (MX-6 2.0L & 626 2.0L)

Check all connectors and hose routings. Check for cracks, leakage and restrictions, and repair as necessary. Start engine, and ensure diaphragm of EGR control valve does not move while engine is cold. Warm engine to operating temperature and operate at idle. Increase engine speed to about 2000 RPM, and ensure diaphragm of EGR control valve moves. If no movement is detected, test EGR components as necessary. See Fig. 62.

System Check (RX7)

Check all connectors and hose routings. Check for cracks, leakage and restrictions, and repair as necessary. Start engine, and ensure diaphragm of EGR control valve does not move while engine is cold. Warm engine to operating temperature and allow it to idle. Ground Blue/Yellow wire at EGR solenoid. Ensure EGR control valve moves and engine idles rough or stalls. If no movement occurs or engine idles smooth, test EGR components as necessary.

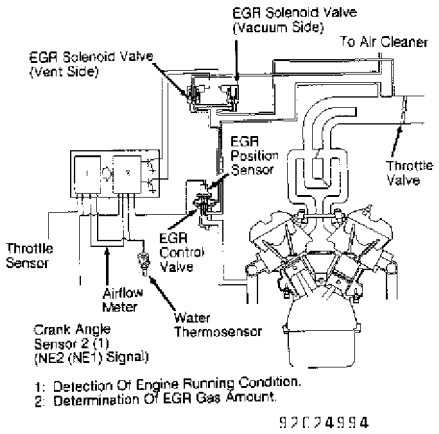


Fig. 61: EGR System Component ID (MX-3 DOHC, MX-6 2.5L & 626 2.5L)
Courtesy of Mazda Motors Corp.

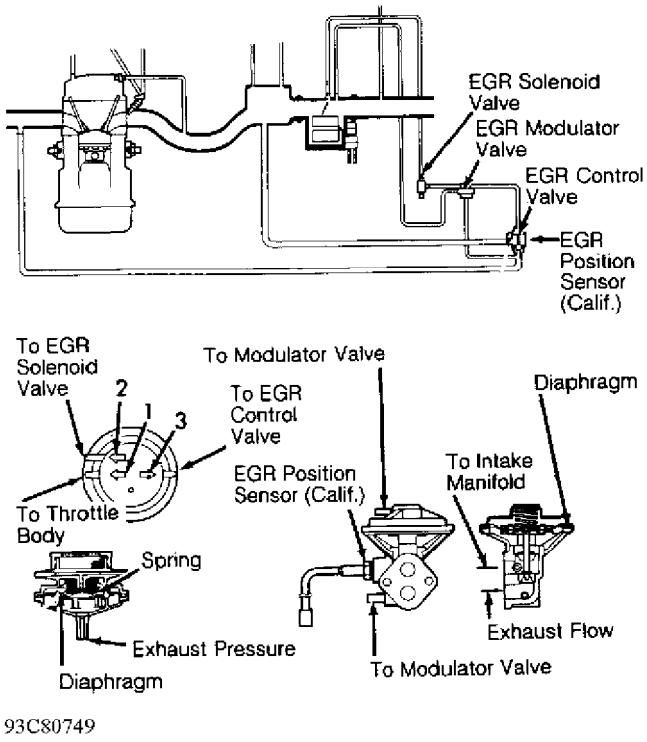


Fig. 62: EGR System Component ID (MX-6 2.0L & 626 2.0L)
Courtesy of Mazda Motors Corp.

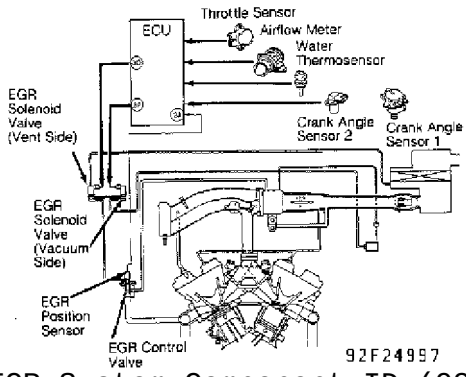


Fig. 63: EGR System Component ID (929)
Courtesy of Mazda Motors Corp.

EGR Control Valve

Bring engine to normal operating temperature and operate at idle. Disconnect and plug vacuum hose at EGR control valve. Engine should run smoothly. Connect vacuum pump to EGR control valve, and apply vacuum. See EGR CONTROL VALVE OPERATING VACUUM table. Engine should run rough or stall. If engine does not operate as specified, clean or replace EGR control valve.

EGR CONTROL VALVE OPERATING VACUUM TABLE

Application	Vacuum in. Hg
MX-3 DOHC	1.6-2.4
MX-6 & 626	
2.0L	6
2.5L	1.6-2.4
RX7	3.3-4.5
929	1.6-2.4

EGR Modulator Valve (MX-6 2.0L & 626 2.0L)

Remove EGR modulator valve. Plug port No. 3, and connect a vacuum pump to port No. 1. See Figs. 56 and 58. Blow into exhaust gas port. Operate vacuum pump and verify vacuum is held. Release exhaust port and verify vacuum is released. Replace EGR modulator valve if it does not test as described.

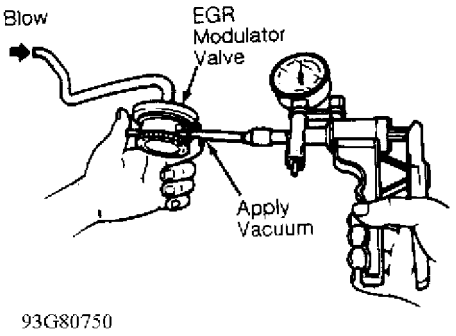


Fig. 64: Testing EGR Modulator Valve (MX-6 2.0L & 626 2.0L)
Courtesy of Mazda Motors Corp.

EGR Position Sensor (MX-3 DOHC)

1) Disconnect ECU electrical connector. Connect Engine Signal Monitor (49-9200-162) and Test Harness (49 G018 903) to ECU. Connect vacuum pump to EGR control valve. Turn ignition on. Check voltage at ECU connector terminals. See EGR POSITION SENSOR VOLTAGE table.

2) If voltage is not correct at terminals "A" and "B", check wiring harness and connection at ECU connector terminals 2J and 3D. If voltage is not correct at terminal "C", check sensor resistance, wiring harness and ECU connector terminal 2I.

3) Disconnect EGR position sensor electrical connector. Connect ohmmeter to EGR position sensor. Disconnect vacuum hose from EGR control valve. Connect vacuum pump to EGR control valve.

4) Check sensor resistance between indicated terminals. See EGR POSITION SENSOR RESISTANCE table. If resistance is not within specifications, replace sensor.

EGR Position Sensor (MX-6 2.0L & 626 2.0L)

Disconnect EGR position sensor electrical connector. Check resistance across terminals. See Fig. 65. At room temperature, resistance should be 182-336 ohms. If resistance is not as specified, replace EGR control valve.

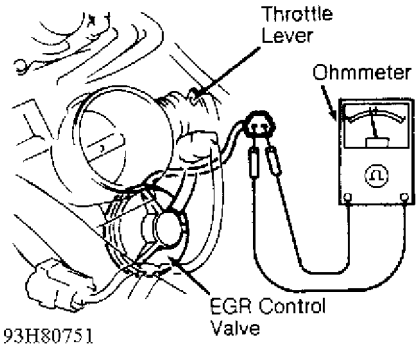


Fig. 65: Testing EGR Position Sensor (MX-6 2.0L & 626 2.0L)
Courtesy of Mazda Motors Corp.

EGR Position Sensor (MX-6 2.5L & 626 2.5L)

1) Disconnect ECU electrical connector. Connect Engine Signal Monitor (49-9200-162) and Test Harness (49 G018 903) between ECU and wiring harness. Disconnect vacuum hose from EGR control valve. Connect vacuum pump to EGR control valve.
2) Turn ignition on. Check voltage at adapter harness connector terminals. See Fig. 66. See EGR POSITION SENSOR VOLTAGE table.
3) If voltage is not correct at terminals "A" and "B", check wiring harness and connection at ECU connector terminals 2J and 3C. If voltage is not correct at terminal "C", check sensor resistance, wiring harness and ECU connector terminal 2I.
4) Disconnect EGR position sensor electrical connector. Disconnect vacuum hose from EGR control valve. Apply vacuum to EGR control valve.
5) Check sensor resistance between indicated terminals. See EGR POSITION SENSOR RESISTANCE table. If resistance is not within specifications, replace sensor.

EGR Position Sensor (929)
1) Disconnect EGR position sensor electrical connector. Connect ohmmeter to EGR position sensor. Disconnect vacuum hose from EGR control valve. Apply vacuum to EGR control valve.
2) Check sensor resistance between indicated terminals. See EGR POSITION SENSOR RESISTANCE table. If resistance is not within specifications, replace sensor.

EGR Switch (RX7 California)
Measure continuity across switch on EGR control valve. Apply 3.3-4.5 in. Hg to EGR control valve. Continuity should be present. If continuity is not present, replace EGR control valve.

EGR POSITION SENSOR VOLTAGE TABLE

Terminal (ECU)	Volts
"A" (2J)	
Without Vacuum	About 0.7
With 5.9 In. Hg	About 4.7
"B" (3D)	Less Than 1.5
"C" (2I)	4.5-5.5

EGR POSITION SENSOR RESISTANCE TABLE

Terminals	Ohms
MX-3 DOHC	
"A" & "B"	
Zero in. Hg	2300
6 in. Hg	5800
"A" & "C"	
Zero in. Hg	5300

6 in. Hg	1200
"B" & "C"	5000
MX-6 2.5L & 626 2.5L	
"A" & "B"	5000
"A" & "C"	700-5000
"B" & "C"	700-5000
929	
"A" & "B"	700-5000
"A" & "C"	700-5000
"B" & "C"	5000

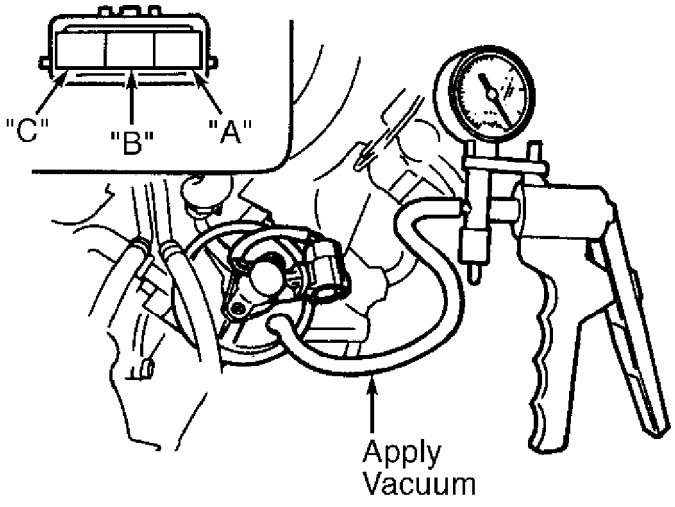


Fig. 66: Testing EGR Position Sensor (MX-6 2.5L & 626 2.5L)
Courtesy of Mazda Motors Corp.

EGR Solenoid Valve (MX-3 DOHC, MX-6 2.5L, 626 2.5L & 929)

1) Disconnect vacuum hoses. Blow air through vacuum hose (vacuum side). Ensure air does not flow. Disconnect EGR solenoid valve (vacuum side) electrical connector. Apply 12 volts and a ground to solenoid valve (vacuum side) terminals. See Fig. 67. Blow air through vacuum hose and ensure air flows.

2) Blow air through vacuum hose (vent side). Ensure air flows. Disconnect EGR solenoid valve (vent side) electrical connector. Apply 12 volts and a ground to solenoid valve (vent side) terminals. See Fig. 67. Blow air through vacuum hose and ensure air does not flow. Replace solenoid valves as necessary.

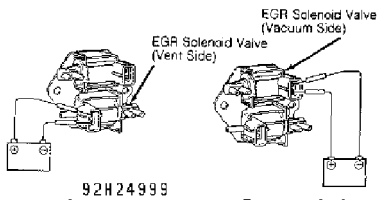


Fig. 67: Testing EGR Solenoid Valves (MX-3 DOHC Shown; MX-6 2.5L, 626 2.5L & 929 Similar)
Courtesy of Mazda Motors Corp.

EXHAUST GAS RECIRCULATION (EGR) (NAVAJO - CALIFORNIA)

System Check

1) Check all connectors and hose routings. Check for cracks, leakage and restrictions, and repair as necessary. Start engine, and ensure diaphragm of EGR control valve does not move while engine is cold. Warm engine to operating temperature and allow it to idle.

2) Disconnect vacuum hose at EGR control valve. See Fig. 68. Ensure less than 1 in. Hg is present. If specified amount of vacuum is present, check EGR control valve. If specified amount of vacuum is not present, test EGR components as necessary.

NOTE: Most EGR problems should set a trouble code in computer memory. For computer control testing of EGR components, see CIRCUIT TEST DL in G - TESTS W/CODES article.

EGR Control Valve

Bring engine to normal operating temperature and operate at idle. Disconnect and plug vacuum hose at EGR control valve. See Fig. 68. Engine should run smoothly. Connect vacuum pump to EGR control valve, and apply 5-10 in. Hg. Engine should run rough. If engine does not run rough, clean or replace EGR control valve.

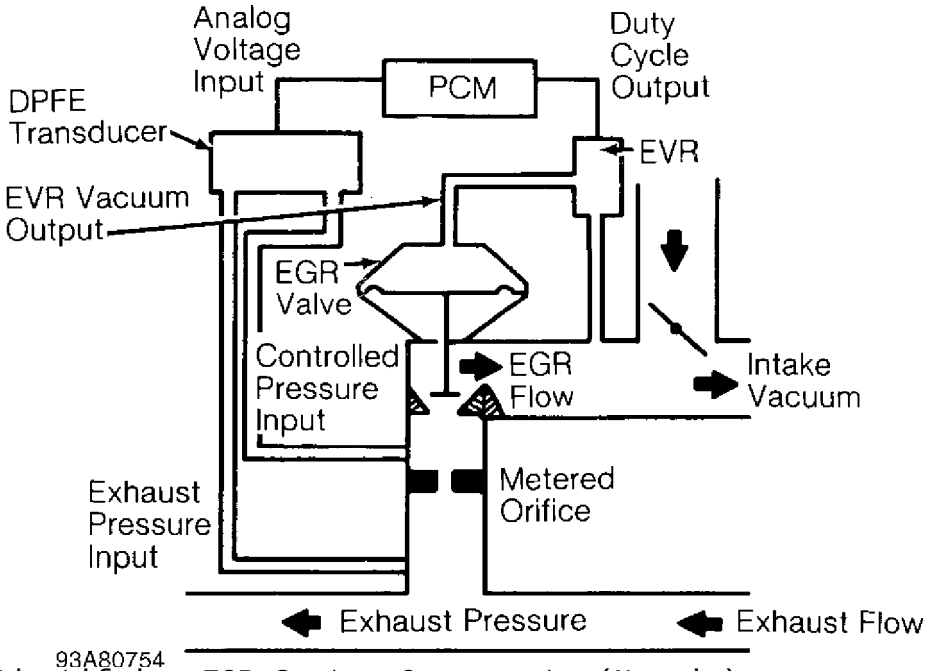


Fig. 68: Identifying EGR System Components (Navajo)
Courtesy of Mazda Motors Corp.

FUEL EVAPORATION (EXCEPT NAVAJO)

System Inspection

Purge system operation takes place when vehicle is accelerating in gear (off idle), engine is at operating temperature

and oxygen sensor is functioning normally. See Fig. 69.

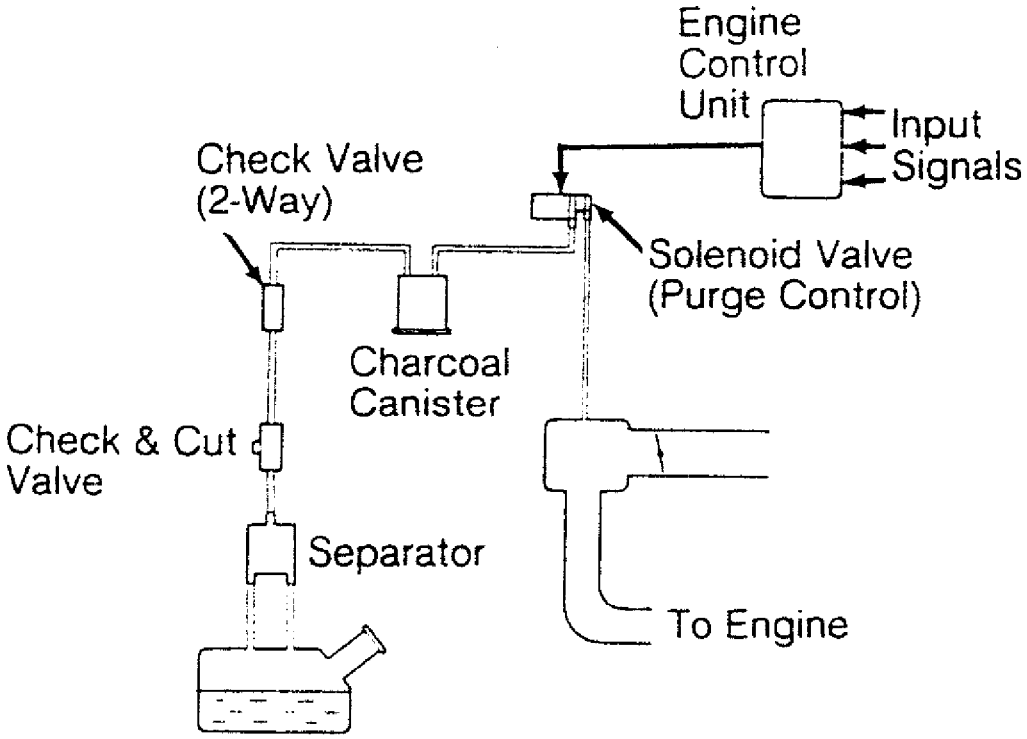


Fig. 69: Identifying Fuel Evaporation Control System Components
Courtesy of Mazda Motors Corp.

Charcoal Canister

Check for loose, missing, cracked and broken connections and parts. Repair or replace as necessary. No liquid should exist in canister.

1-Way Check Valve (B2200, B2600i & MPV)

Note direction of valve installation. Remove check valve. Blow air into both ends of valve. Air should flow through valve from charcoal canister side but should not flow from airflow meter side (beveled end). Replace valve as necessary.

2-Way Check Valve (All Except B2200, B2600i & MPV)

Remove check valve. Connect a vacuum pump to one end of check valve. Air should flow with about 1-1.7 in. Hg applied. Connect vacuum pump to other end of check valve. Air should also flow with about 1-1. 7 in. Hg applied. Replace valve as necessary.

3-Port Check Valve (Miata A/T & 929)

Note direction of valve installation. Remove check valve. Cap port going to 2-way check valve. Connect a vacuum pump to lower port. Air should flow from port going to fuel tank with 3.0 in. Hg applied. Replace valve as necessary.

Check & Cut Valve (B2200, B2600i, MPV, MX-3, Protege & 323)

1) Remove check and cut valve. Connect pressure gauge with "T" fitting to check and cut valve nipple leading to fuel tank. Cap opposite nipple. See Fig. 70.

2) Blow air through port "A". On MX-3, Protege and 323, valve should open when pressure gauge indicates 0.92-1.20 psi (.065-.085 kg/cmý). On all other models, valve should open when pressure gauge reads 0.78-1.00 psi (.06-.07 kg/cmý). Remove "T" fitting and pressure gauge. Connect "T" fitting to bottom of valve. Blow air through port "B". When pressure gauge reads .14-.71 psi (.01-.05 kg/cmý), valve should open. Replace cut and check valve as necessary.

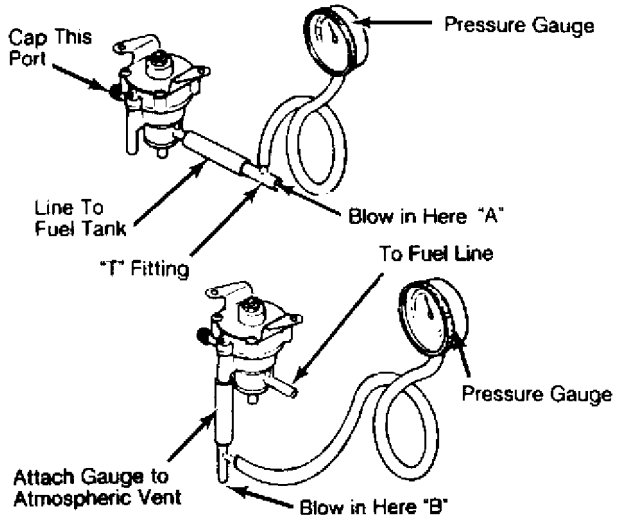


Fig. 70: Testing Check & Cut Valve
Courtesy of Mazda Motors Corp.

Fuel Vapor Valve (B2200, B2600i, Miata, MX-6, RX7, 626 & 929)

Remove fuel vapor valve. Blow air into upper port of valve. Air should flow through valve to lower port. Turn valve upside down. Blow air through lower port of valve. Air should not flow. Replace valve as necessary.

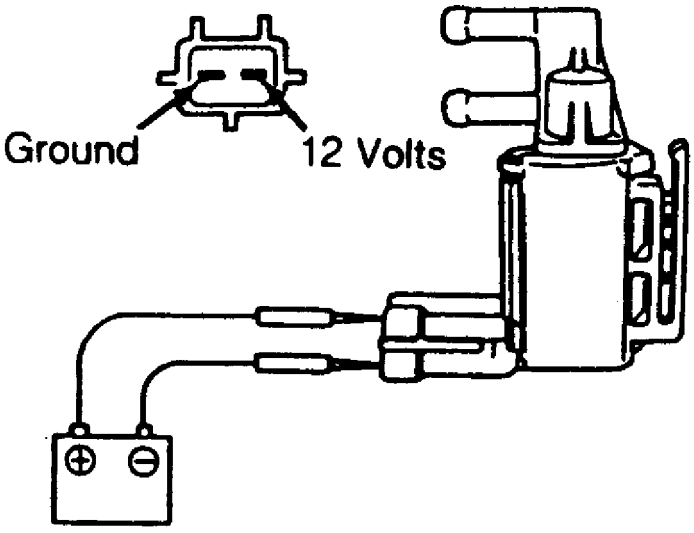
Purge Control Solenoid Valve

1) Warm engine to normal operating temperature and operate at idle. Disconnect vacuum hoses from solenoid valve. Ensure vacuum is not present at solenoid valve. Disconnect vacuum hoses from charcoal canister.

2) Ensure air does not flow through solenoid valve. If air

flows through solenoid valve, disconnect solenoid valve connector. Connect 12 volts and a ground to solenoid valve terminals. See Fig. 71. Blow air through check valve. Air should flow through valve. Replace valve as necessary.

Separator
Check for loose, missing, cracked and broken connections and parts. Repair or replace as necessary. No liquid should exist in canister.



50D16819
Fig. 71: Testing Purge Control Solenoid Valve
Courtesy of Mazda Motors Corp.

FUEL EVAPORATION (NAVAJO)

Canister Purge (CANP) Solenoid
1) Disconnect CANP solenoid harness connector. Set DVOM to 200-ohm scale. Measure resistance across CANP solenoid terminals. Resistance should be 40-90 ohms. If resistance is not as specified, replace CANP solenoid.
2) Disconnect vacuum hose at CANP solenoid on manifold vacuum side. Apply 16 in. Hg to manifold vacuum side of solenoid. CANP solenoid should hold vacuum for 20 seconds. Using jumper wires, energize CANP solenoid. Vacuum should flow through solenoid. If CANP solenoid does not test as described, replace solenoid.
3) Faults in CANP solenoid or circuit should set a service code. See QUICK TEST in G - TESTS W/CODES article. If no service code has been set, see CIRCUIT TEST KD in G - TESTS W/CODES article for additional solenoid and circuit testing.

EVAP Canister
Check for loose, missing, cracked and broken connections and parts. Repair or replace as necessary. No liquid should exist in canister.

POSITIVE CRANKCASE VENTILATION (PCV)

System Inspection

1) Warm engine to normal operating temperature, and operate it at idle. Disconnect Positive Crankcase Ventilation (PCV) valve, together with vent hose, from valve cover. Block PCV valve opening and check for vacuum. If no vacuum is felt, check for collapsed line and blockage.

2) Note direction of valve installation. Remove PCV valve. Blow air into upper port of valve. Air should flow through valve from lower port. Blow air through lower port of valve. Air should not flow from upper port. Replace valve as necessary.

THERMOSTATIC AIR CLEANER (TAC) (NAVAJO)

Air Cleaner Temperature Sensor

With temperature sensor less than 75øF (24øC), apply 8 in. Hg to source port. Duct door should close. If door does not close, replace sensor.

Air Control Door

When 8 in. Hg or more is applied to vacuum motor, door should stay in appropriate position for as long as vacuum is applied. If vacuum bleeds off and door returns to rest position, replace vacuum motor.

MISCELLANEOUS CONTROLS

A/C CLUTCH

A/C Cut-Off Control System (B2200, B2600i, Miata, MPV, MX-3,MX-6, RX7, 626 & 929)

1) Turn A/C, blower and ignition on. DO NOT start engine. Shift transmission into a drive gear. Open throttle fully. Listen for A/C clutch disengaging and re-engaging after a few seconds. See A/C CUT-OFF TIME SPECIFICATIONS table.

2) If system does not function as specified, check operation of related switches, sensors and relays. See J - PIN VOLTAGE CHARTS article.

A/C CUT-OFF TIME SPECIFICATIONS TABLE

Application	Time Before Re-Engagement
B2200, B2600i, MPV 2.6L, MX-3 DOHC, MX-6, RX7, 626 & 929	5 Seconds
Miata	16 Seconds
MPV 3.0L & MX-3 SOHC	10 Seconds

Wide Open Throttle A/C Cut-Out (WAC) & A/C Demand Switch (Navajo)

Faults in WAC & A/C demand switch or circuit should set a service code. See QUICK TEST in G - TESTS W/CODES article. If no service code has been set, see CIRCUIT TEST KM in G - TESTS W/CODES article in the ENGINE PERFORMANCE section for testing.

ANTI-BACKFIRE

Anti-Afterburn Control (RX7)

Start engine and allow it to idle. Disconnect Idle Speed Control (ISC) connector. Raise engine speed to more than 4000 RPM, and quickly close throttle. Engine should idle rough at 1000-1500 RPM. No other information is available.

EXHAUST CONTROL

Variable Exhaust System (929)

1) With engine idling, ensure exhaust gas comes out of one exhaust pipe. Raise engine speed to 3500 RPM. Exhaust gas should come out of both exhaust pipes.

2) To test control motor, remove inside-rear trunk panel. Disconnect control motor connector. Apply 12 volts to Yellow/Black wire and ground to Blue wire. Control motor should rotate clockwise. Reverse leads and control motor should rotate counterclockwise. If system does not function as specified, check wiring between computer and control motor. See J - PIN VOLTAGE CHARTS article.

END OF ARTICLE

J - PIN VOLTAGE CHARTS
Article Text

1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 07:17AM

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda Pin Voltage Charts

RX7

INTRODUCTION

Pin voltage charts are supplied to reduce diagnostic time. Checking pin voltages at the Engine Control Unit (ECU) or Powertrain Control Module (PCM) determines whether ECU or PCM is receiving and transmitting proper voltage signals. Charts may also help determine if ECU or PCM harness is shorted or opened.

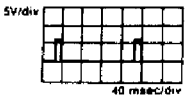
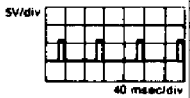
NOTE: Unless stated otherwise in testing procedures, perform all voltage tests using a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance. Voltage readings may vary slightly due to battery condition or charging rate.

NOTE: For complete pin voltage information, see appropriate trouble code information in appropriate G - TESTS W/ CODES article.

J - PIN VOLTAGE CHARTS
Article Text (p. 2)
1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 07:17AM

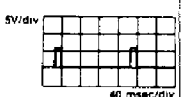
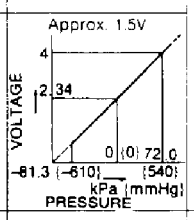
RX7 (1 OF 7)

Terminal	Input	Output	Connected to	Test condition		Correct voltage	Remark
1A	–	–	Battery	Constant		12V	For backup
1B	○		Main relay (FUEL INJ relay)	Ignition switch	OFF	12V	–
					ON	12V	
1C	○		Ignition switch (START)	While cranking		12V	–
				Ignition switch ON		Below 1.0V	
1D		○	Self-Diagnosis checker (monitor lamp)	Test switch at SELF TEST Lamp illuminated for 3 sec. after ignition switch OFF → ON		4.5–5.5V	With Self-Diagnosis checker and System Selector
				Lamp not illuminated after 3 sec.		12V	
				Test switch at O_2 MONITOR Lamp illuminated		4.5–5.5V	
				Test switch at O_2 MONITOR Lamp not illuminated		12V	
1E	○		A/C switch	A/C switch ON		Below 3.0V	• With Blower SW ON • Ignition switch ON
				A/C switch OFF		12V	
1F		○	Self-Diagnosis checker (code number)	Buzzer sounded for 3 sec. after ignition switch OFF → ON		Below 2.5V	• With Self-Diagnosis checker and System Selector • With System Selector test switch at SELF TEST
				Buzzer not sounded for after 3 sec.		12V	
				Buzzer sounded		Below 2.5V	
				Buzzer not sounded		12V	
1G		○	Igniter (Trailing) Front rotor	Ignition switch ON		0V	–
				Idle Oscilloscope		0.2–0.5V (Reference) 	
				Engine speed: above 2,500 rpm		0.5–0.8V (Reference)	Initial acceleration
1H		○	Igniter (Leading)	Ignition switch ON		0V	–
				Idle Oscilloscope		0.2–0.5V (Reference) 	
				Engine speed: above 2,500 rpm		0.8–1.2V (Reference)	Initial acceleration

93A79988

Fig. 1: ECU Pin Voltage Chart (1 Of 7)
Courtesy of Mazda Motors Corp.

RX7 (2 OF 7)

Terminal	Input	Output	Connected to	Test condition	Correct condition	Remark
1I	○		Diagnosis connector (TEN terminal)	System Selector test switch at O_2 MONITOR	12V	• With System Selector • Ignition switch ON
				System Selector test switch at SELF TEST	0V	
1J		○	Igniter (Trailing) Rear rotor	Ignition switch ON	0V	–
				Idle	0.2–0.5V (Reference)	
				Oscilloscope		
				Engine speed: above 2500 rpm	0.5–0.8V (Reference)	Initial acceleration
1K		○	Fuel pump relay	Ignition switch ON	Below 1.0V	
				While cranking	Below 1.0V	
				Idle — Solenoid valve (PRC) does not operate	12V	
				Idle — Solenoid valve (PRC) operates	Below 1.0V	
1L		○	A/C relay	While cranking	12V	A/C switch, Blower switch ON
				Idle	Below 1.0V	
				During acceleration (Running)	12V	
1M	○		Speedometer sensor	Ignition switch ON	4.0–5.0V	–
				Driving	2.0–2.5V	
1N	○		P/S pressure switch	P/S OFF at idle	12V	–
				P/S ON at idle	Below 1.0V	
			Mileage switch	Under 20,000 miles {34,000 km}	Below 1.5V	Ignition switch ON after 2 seconds
				Over 20,000 miles {34,000 km}	12V	
1O	○		Pressure sensor	Ignition switch ON	Approx. 2.6V	–
				Idle	Approx. 1.5V 	
1P	–	–	–	–	–	–

93B79989

Fig. 2: ECU Pin Voltage Chart (2 Of 7)
Courtesy of Mazda Motors Corp.

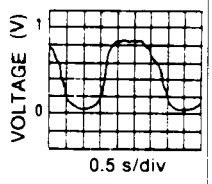
RX7 (3 OF 7)

Terminal	Input	Output	Connected to	Test condition	Correct voltage	Remark
1Q	○		Clutch switch (MT)	Clutch pedal: released	12V	Ignition switch ON
				Clutch pedal: depressed	Below 1.0V	
			EC-AT control unit (AT)	Idle	12V	Reduce torque signal
				When shifting from 1st to 2nd or from 2nd to 3rd with the throttle opening above 1.5/8	Below 1.0V	
				Idle	12V	Slip lock up signal
				When slip lockup with the throttle opening below 0.5/8	Below 1.0V	
1R	○		Neutral switch (MT)	Neutral	Below 1.0V	Ignition switch ON
				In gear	12V	
			EC-AT control unit (AT)	P or N range	Below 1.0V	• Inhibitor signal • Ignition switch ON
				Other	12V	
1S	○		Stoplight switch	Brake pedal released	Below 1.0V	Ignition switch ON
				Brake pedal depressed	12V	
1T		○	Circuit opening relay	Ignition switch ON	12V	–
				Idle	Below 1.0V	
1U	○		Fuel thermosensor	Idle (after warm up)	1.5–3.0V	
1V	–	–	–	–	–	–
2A	–	–	–	–	–	–
2B		○	Diagnosis connector (IG-terminal)	Ignition switch ON	0V	–
				Idle	0.3–0.8 (Reference)	
				Engine speed: 3,000 rpm	1.8–2.2V (Reference)	Initial acceleration
2C		○	EC-AT (AT) control unit	Idle	12V	Slip lock up OFF signal
				Engine speed: hold 3,000 rpm (after 5 seconds)	Below 1.0V	Initial acceleration
2D		○	EC-AT control unit (AT)	Ignition switch ON	2–4.5V	Atmospheric pressure signal
2E		○	EC-AT control unit (AT)	Idle	Below 1.0V	Idle signal
				Other	Approx 5V	
2F		○	Open (ex. Canada)	Constant	1–2.5V	–
			Ground (Canada)	Constant	0V	
2G		○	EC-AT control unit (AT)	Idle	12V	Torque reduced signal
				Throttle opening above 1/8 (Engine coolant temp. below 40°C (104°F))	Below 1.0V	
2H	–	–	–	–	–	–
2I	○		Heat Hazard Sensor	Ignition switch ON	Below 2.0V	
				Idle (Temp.: Below 100°C (212°F))	12V	
				Idle (Temp.: Above 100°C (212°F))	Below 1.0V	
2J		○	A/P relay	Engine speed Idle–Below 3,250 rpm	Below 1.0V	
				Engine speed above 3,250 rpm	12V	

93E79990

Fig. 3: ECU Pin Voltage Chart (3 Of 7)
Courtesy of Mazda Motors Corp.

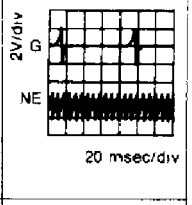
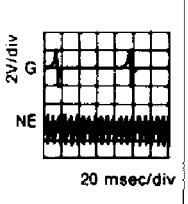
RX7 (4 OF 7)

Terminal	Input	Output	Connected to	Test condition		Correct voltage	Remark
2K	○		1–2 switch (MT)	1st position		12V	Ignition switch ON
				Other		Below 1.0V	
			EC–AT CU (AT)	2nd or 3rd position		Below 1.0V	While running
				Other		12V	
2L	○		1–2 switch (MT)	2nd position		Below 1.0V	Ignition switch ON
				Other		12V	
			EC–AT CU (AT)	3rd or O/D position		Below 1.0V	While running
				Other		12V	
3A	○		Metering oil pump position sensor	Ignition switch ON		1.0–4.2V	Voltage increase when accelerating
				Idle		Approx. 1.1V	
				Accelerator pedal depressed		1.1–4.2V	
3B	○		E/L unit	Headlight switch position I, II,		Below 4.0V	
				Blower motor position III, IV,			
				Rear defroster switch ON			
				Headlight switch, Blower motor, rear defroster switch are OFF		5V	
3C	○		Oxygen sensor	Idle	Cold engine	Approx 0V	
					After warm up	0.0–1.0V  Oscilloscope	
				Acceleration (after warm up)		0.5–1.0V	
				Deceleration (after warm up)		0.0–0.4V	
3D		○	Cooling fan relay	Idle	During electrical cooling fan operating	12V	
					Electrical cooling fan does not operate	Below 1.0V	
				TFA terminal of diagnosis connector is grounded		Below 1.0V	Ignition switch ON
3E	○		Water thermosensor	Engine coolant temperature 20°C (68°F)		Approx. 2.5V	Ignition switch ON
				After warm up		Below 0.5V	
3F	○		Throttle sensor (Narrow range)	Accelerator pedal released		0.75–1.25	• Ignition switch ON • After warm-up
				Accelerator pedal fully depressed		4.8–5.0	
3G	○		Throttle sensor (Full range)	Accelerator pedal released		0.1–0.7	• Ignition switch ON • After warm-up
				Accelerator pedal fully depressed		4.2–4.6	
3H		○	Solenoid valve (purge control)	Ignition switch ON		12V	
				Idle			
				Engine speed: 1,500–3,300 rpm		4–10V	While running

93F79991

Fig. 4: ECU Pin Voltage Chart (4 Of 7)
Courtesy of Mazda Motors Corp.

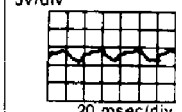
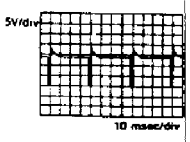
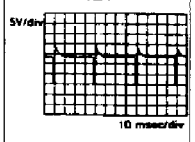
RX7 (5 OF 7)

Terminal	Input	Output	Connected to	Test condition		Correct voltage	Remark
3I	○		Throttle sensor	Constant		Approx. 5.0V	Ignition switch ON
3J	○		EGR switch	EGR valve operates		12V	California only
				EGR valve does not operate		Below 1.0V	
	○		DRL relay	Idle	Pull the parking brake (Turnlight OFF)	0V	Canada only
					Release the parking brake (Turnlight ON)	12V	
3K		○	Solenoid valve (Relief2)	Ignition switch ON		12V	
				Idle	Before warm up approx. 40°C (104°F)	Below 1.0V	
					After warm up	12V	
3L	○		Intake air thermosensor	Ambient air temperature 20°C (68°F)		Approx. 2.5V	Ignition switch ON
				After warm up		Approx. 0.6V	
3M	○		Knock sensor	Ignition switch ON		Approx. 2.5V	
				Knocking occur (Tap the engine hanger with hammer)		2.6–2.8V (Reference)	Ignition switch ON
3N		○	Solenoid valve (Port air by-pass)	Ignition switch ON		12V	
				After warm up Engine speed: 1,500–3,000 rpm		Below 1.0V	While running
3O		○	Solenoid valve (Double throttle control)	Engine coolant temperature below 80°C (176°F)		Below 1.0V	Ignition switch ON
				After warm up		12V	
3P		○	Solenoid valve (Relief1)	Idle		12V	• After warm up • While running
				Engine speed: 2,700–3,200 rpm		Below 1.0V	
4A	–	–	Ground (Output)	Constant		0V	–
4B	–	–	Ground (Output)	Constant		0V	–
4C	–	–	Ground (CPU)	Constant		0V	–
4D	–	–	Ground (Input)	Constant		0V	–
4E	○		Crank angle sensor [NE + signal]	Ignition switch ON		Below 1.0V	Engine signal monitor: Red lamp flash
				Idle	Oscilloscope		
					Voltmeter	0.1–0.4V (Reference)	
4F		○	Solenoid valve (Split air by-pass)	Idle		12V	
				5th position (MT) / OD (AT)		Below 1.0V	• After warm up • While running
4G	○		Crank angle sensor [G signal]	Ignition switch ON		Below 1.0V	
				Idle	Oscilloscope		
					Voltmeter	0.1–0.4V (Reference)	

93G79992

Fig. 5: ECU Pin Voltage Chart (5 Of 7)
Courtesy of Mazda Motors Corp.

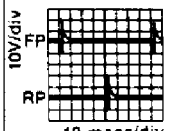
RX7 (6 OF 7)

Terminal	Input	Output	Connected to	Test condition	Correct voltage	Remark
4H	○		Crank angle sensor	Constant	Below 1.0V	-
4I		○	Stepping motor (Metering oil pump)	Ignition switch ON	12V	
4J, 4K, 4L				Idle	3 terminals / 4 terminals 12V Other terminal 5–9V	
4M		○	Solenoid valve (Pressure regulator control)	Idle	12V	
				Idle after hot start	Below 1.0V	approx. 1 minute
4N		○	Solenoid valve (Switching)	Ignition switch ON/Idle	12V	
				Engine speed: above 3,200 rpm (After warm up)	Below 1.0V	Initial acceleration
4O		○	Solenoid valve (EGR)	Idle	12V	
				5th position (MT)/OD (AT)	Below 1.0V	While running
4P		○	Solenoid valve (AWS)	Before warm up approx. 40°C (104°F)	Below 1.0V	Idle
				After warm up	12V	
4Q		○	Solenoid valve (ISC)	Ignition switch ON	8.0–11.0V	Reference valve ● Cranking 99% ● Idle 32–65% ● Initial set 38%
				Idle Oscilloscope	5.0–11.0 (Reference) 	
4R		○	Solenoid valve (Turbo control)	Idle	12V	
				Engine speed: above 5,500 rpm (MT) Engine speed: above 5,250 rpm (AT)	Below 1.0V	Initial acceleration
4S		○	Solenoid valve (Charge relief)	Idle	12V	
				Engine speed: 4,000–5,500 rpm (MT) for 8 sec. 3,500–5,000 (AT) for 4 sec.	Below 1.0V	Initial acceleration
				Engine speed: above 5,500 rpm (MT) above 5,250 rpm (AT)		
4T		○	Solenoid valve (Charge control)	Idle	Below 1.0V	
				Engine speed: above 5,500 rpm (MT) Engine speed: above 5,250 rpm (AT)	12V	Initial acceleration
4U		○	Solenoid valve (Wastegate control)	Ignition switch ON	12V	Reference valve ● Idle 5% ● Solenoid valve (Turbo control) before operates 95%
				Idle Oscilloscope	12V 	
				Initial acceleration	5.0–11.0 V	
4V		○	Solenoid valve (Turbo precontrol)	Ignition switch ON	12V	Reference valve ● Idle 5% ● Solenoid valve (Turbo control) after operates 5%
				Idle Oscilloscope	12V 	
				Engine speed: above 3,000 rpm	4.0–10.0V (Reference)	Initial acceleration

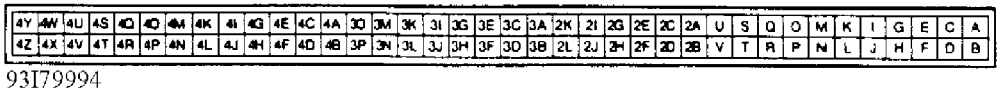
93H79993

Fig. 6: ECU Pin Voltage Chart (6 Of 7)
Courtesy of Mazda Motors Corp.

RX7 (7 OF 7)

Terminal	Input	Output	Connected to	Test condition	Correct voltage	Remark
4W		○	Injector (Front primary)	Ignition switch ON	12V	• Secondary injector not working at no load condition * Engine Signal Monitor: Green lamp flash
4X		○	Injector (Front secondary)	Idle*	12–14V	
4Y		○	Injector (Rear primary)	Oscilloscope		
4Z		○	Injector (Rear secondary)			

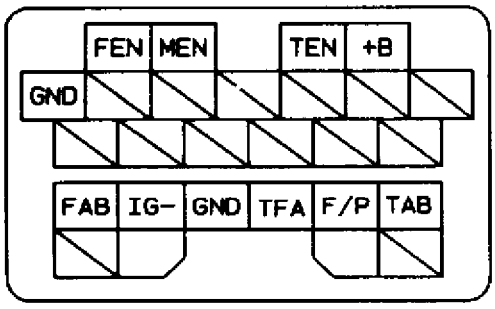
ECU CONNECTOR TERMINAL IDENTIFICATION



93I79994

Fig. 7: ECU Pin Voltage Chart (7 Of 7)
Courtesy of Mazda Motors Corp.

DIAGNOSIS CONNECTOR TERMINAL IDENTIFICATION



Diagnosis connector is also referred to as Data Link Connector (DLC).

93D79999

Fig. 8: Identifying Diagnosis Connector Terminals
Courtesy of Mazda Motors Corp.

END OF ARTICLE

L - WIRING DIAGRAMS
Article Text
1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 07:18AM

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda Wiring Diagrams

RX7

WIRING DIAGRAMS

MAZDA
1W-16

1993 ENGINE PERFORMANCE
Wiring Diagrams (Cont.)

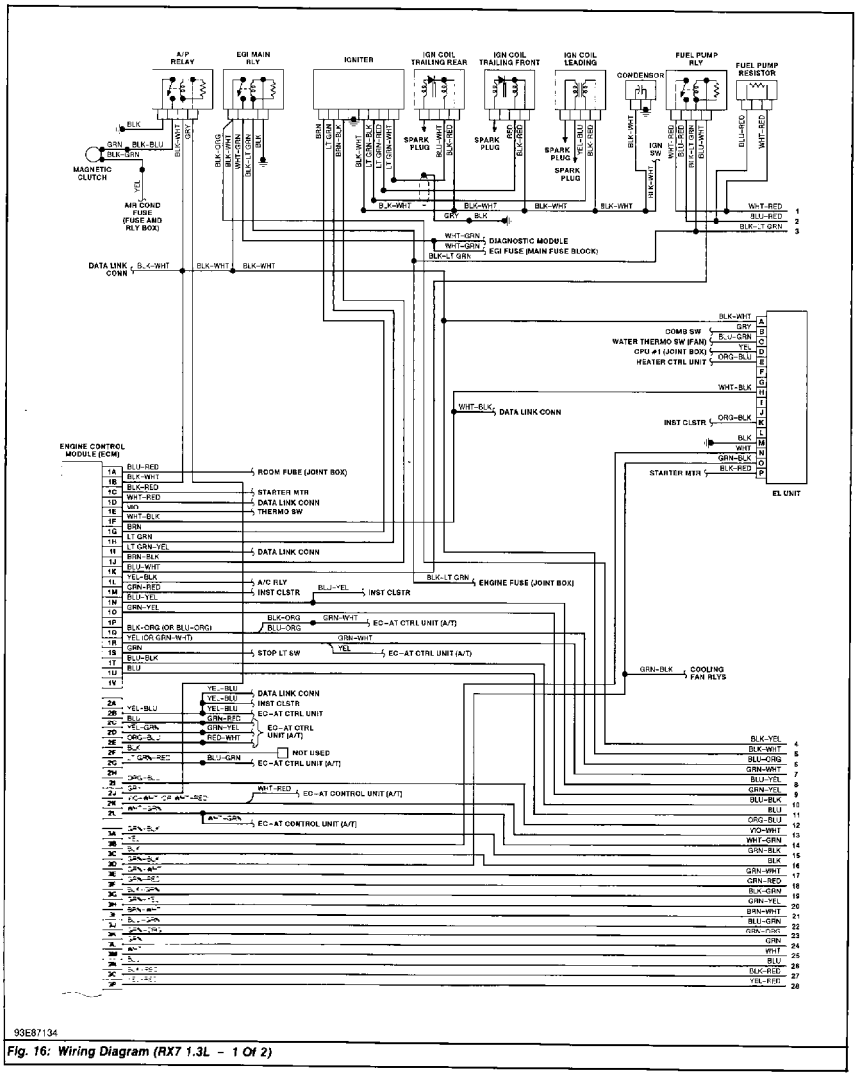


Fig. 16: Wiring Diagram (RX7 1.3L - 1 Of 2)

Fig. 1: Wiring Diagram (RX7 1.3L - 1 Of 2)

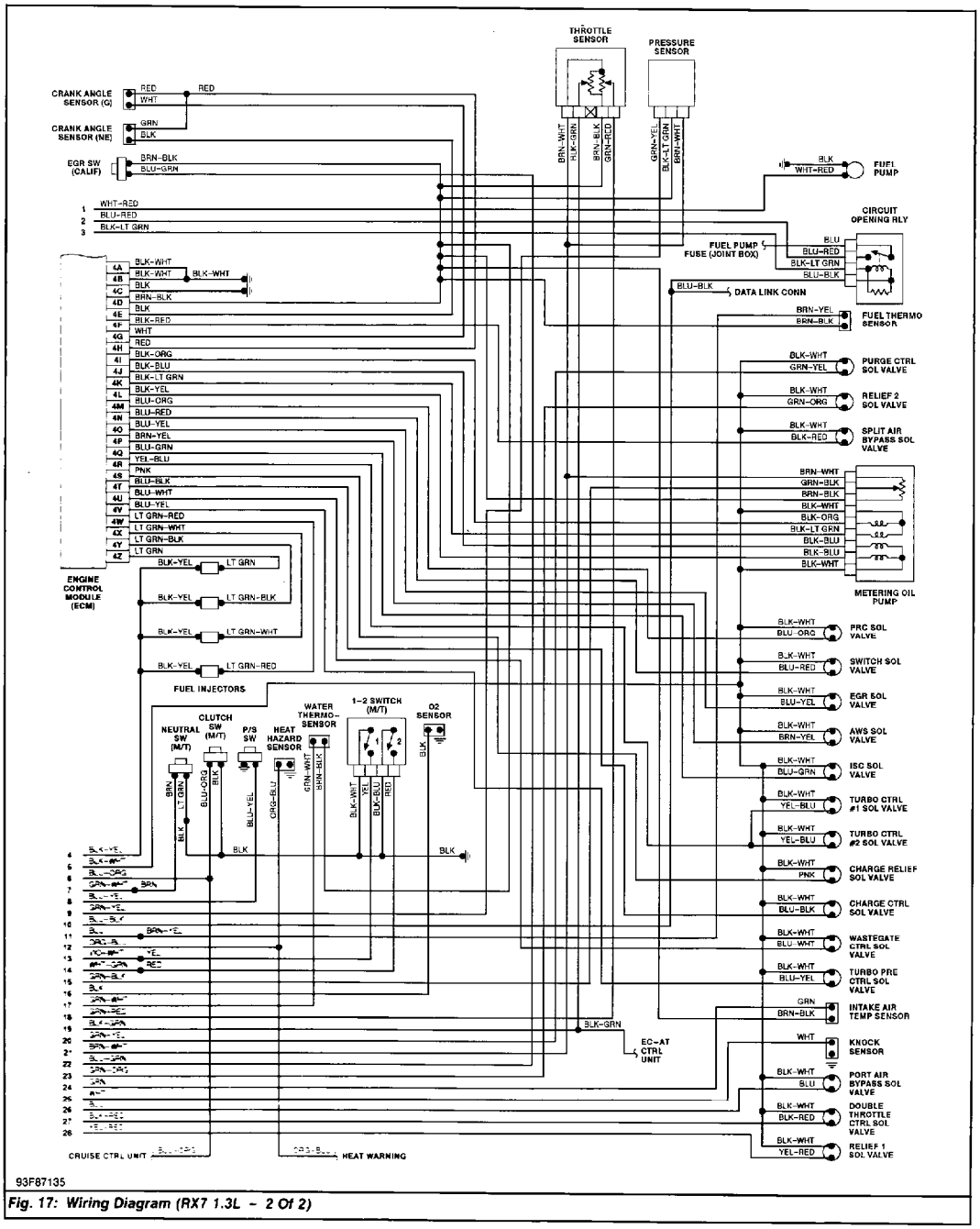


Fig. 17: Wiring Diagram (RX7 1.3L - 2 Of 2)

Fig. 2: Wiring Diagram (RX7 1.3L - 2 Of 2)

END OF ARTICLE

M - VACUUM DIAGRAMS
Article Text

1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 07:18AM

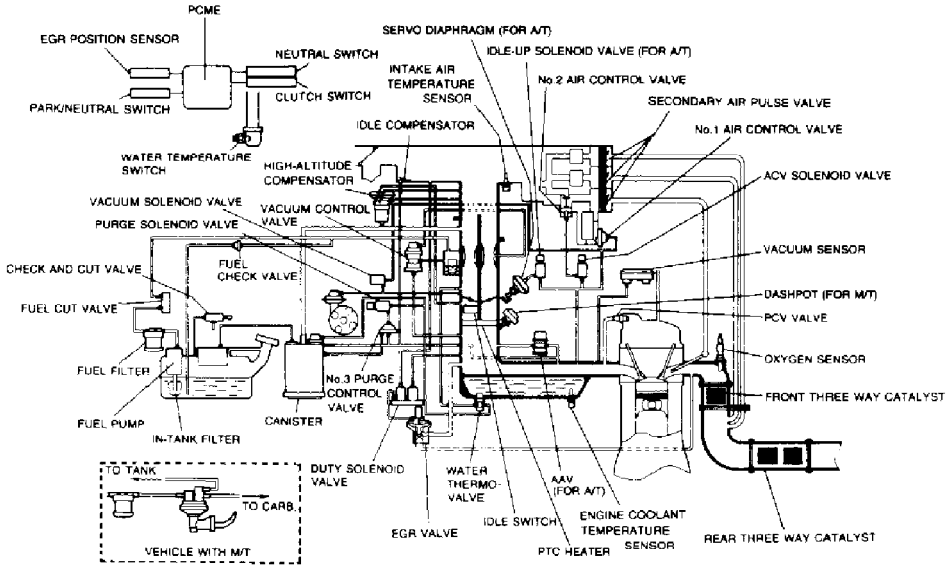
ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda Vacuum Diagrams

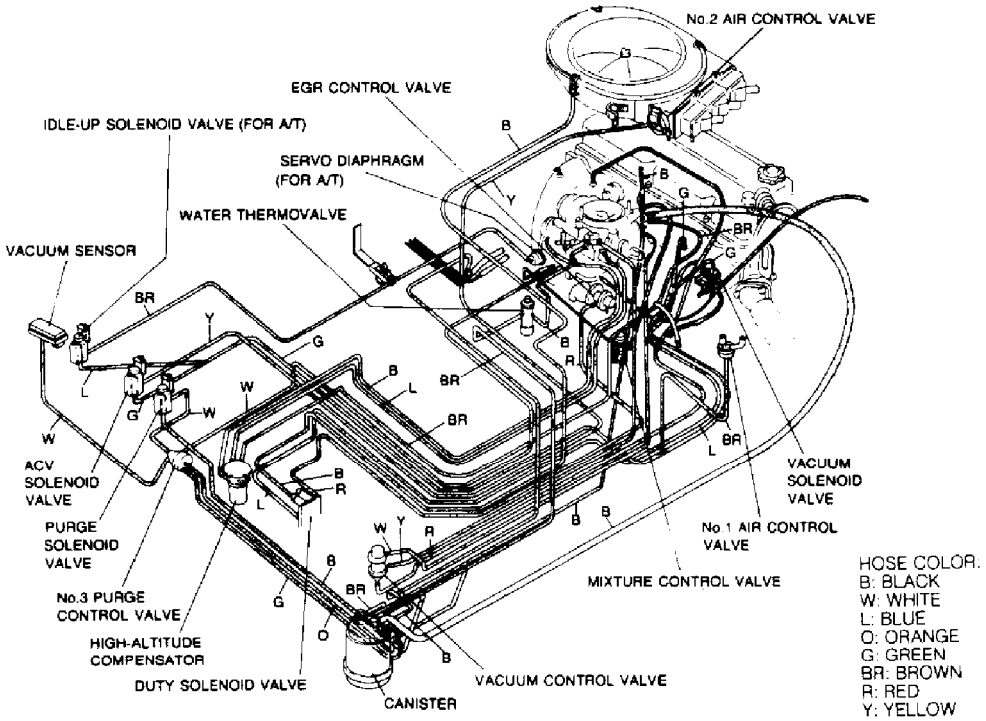
B2200, B2600i, Miata, MPV, MX-3, MX-6, Navajo, Protege, RX7, 323, 626 & 929

INTRODUCTION

This article contains underhood views or schematics of vacuum hose routing. Use these vacuum diagrams during the visual inspection in F - BASIC TESTING article. This will assist in identifying improperly routed vacuum hoses which cause driveability and/or computer indicated malfunctions.



VACUUM SYSTEM SCHEMATIC



VACUUM HOSE ROUTING DIAGRAM

93E80006

Fig. 1: Vacuum System Schematic (B2200 2.2L Carbureted)
Courtesy Of Mazda Motors Corp.

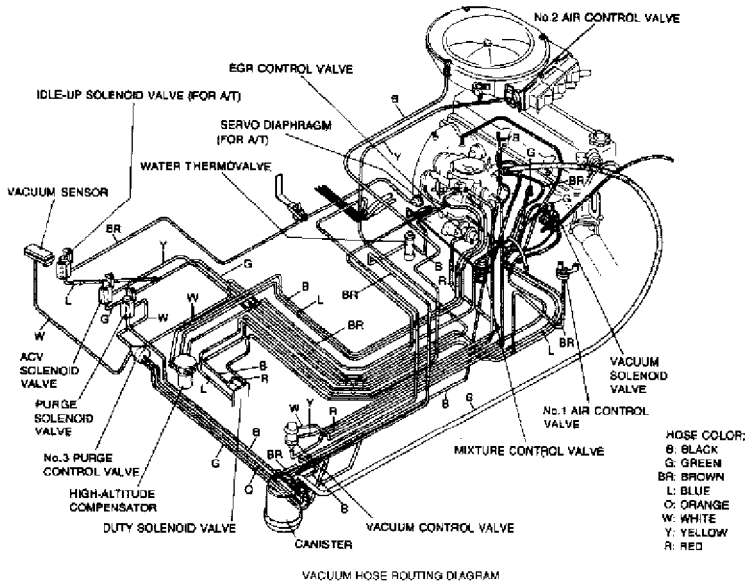
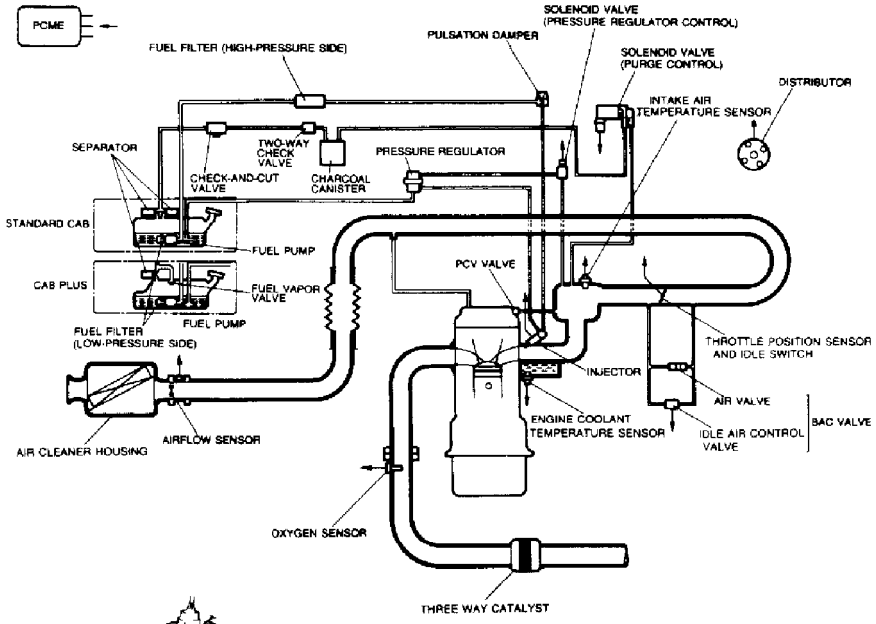
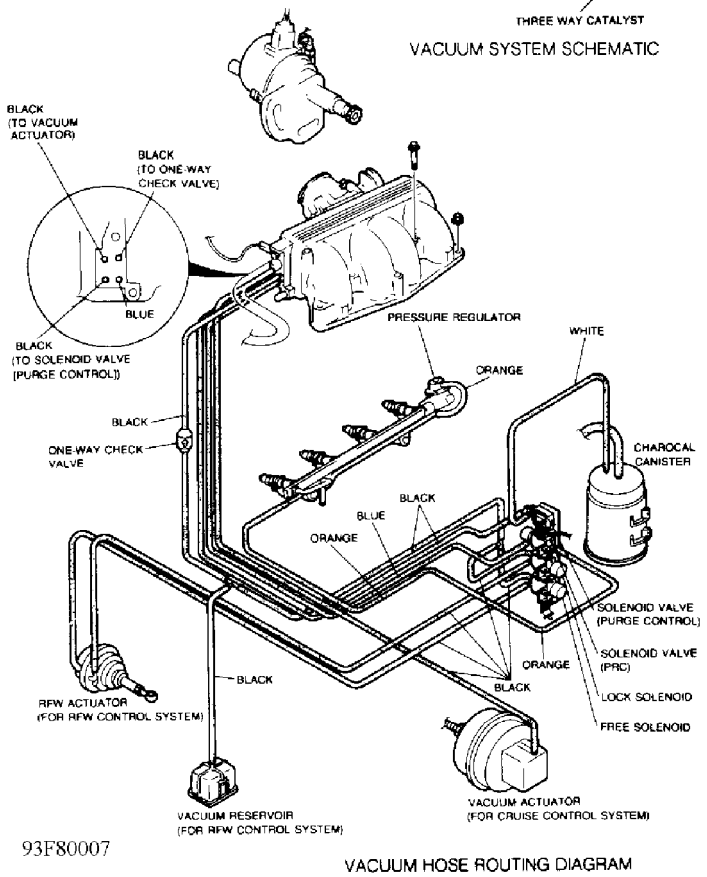


Fig. 2: Vacuum Hose Routing Diagram (B2200 2.2L Carbureted) Courtesy Of Mazda Motors Corp.



VACUUM SYSTEM SCHEMATIC



VACUUM HOSE ROUTING DIAGRAM

Fig. 3: Vacuum System Schematic (B2200 2.2L PFI & B2600i 2.6L)
Courtesy Of Mazda Motors Corp.

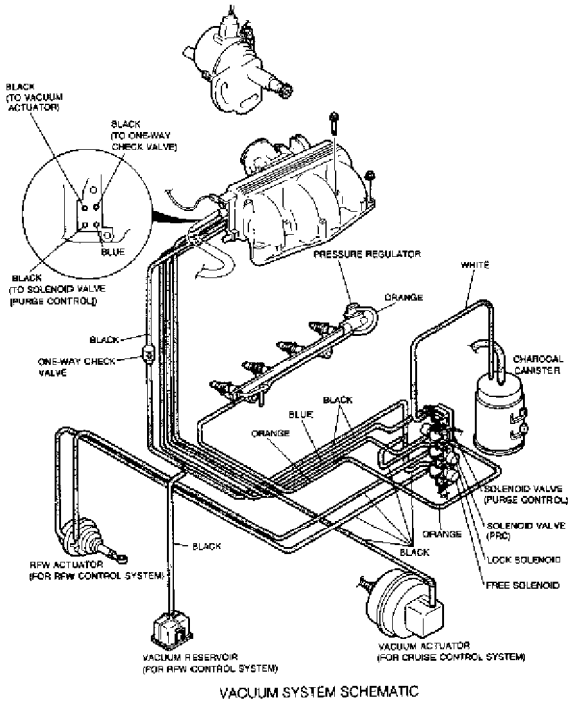


Fig. 4: Vacuum Hose Routing Diagram (B2200 2.2L PFI & B2600i 2.6L)
Courtesy Of Mazda Motors Corp.

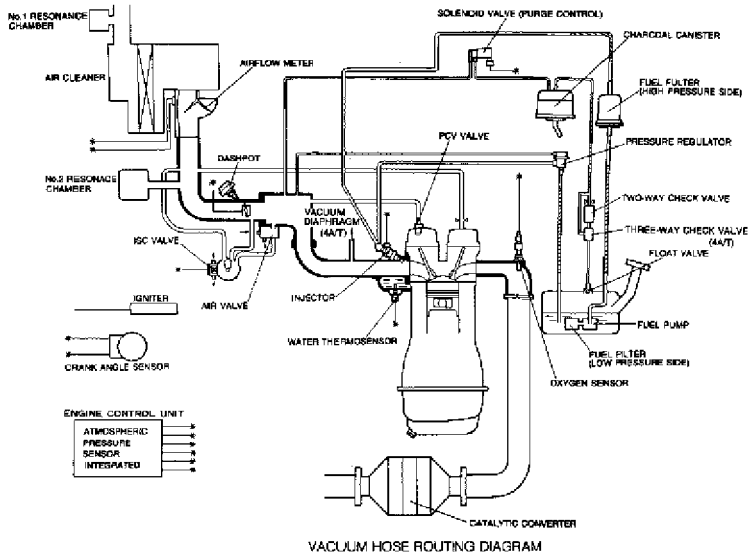


Fig. 5: Vacuum System Schematic (Miata 1.6L)
Courtesy Of Mazda Motors Corp.

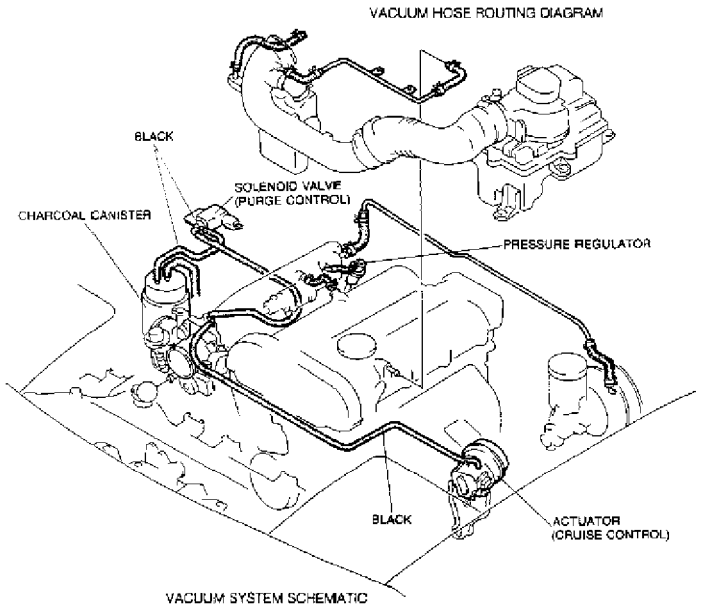


Fig. 6: Vacuum Hose Routing Diagram (Miata 1.6L)
Courtesy Of Mazda Motors Corp.

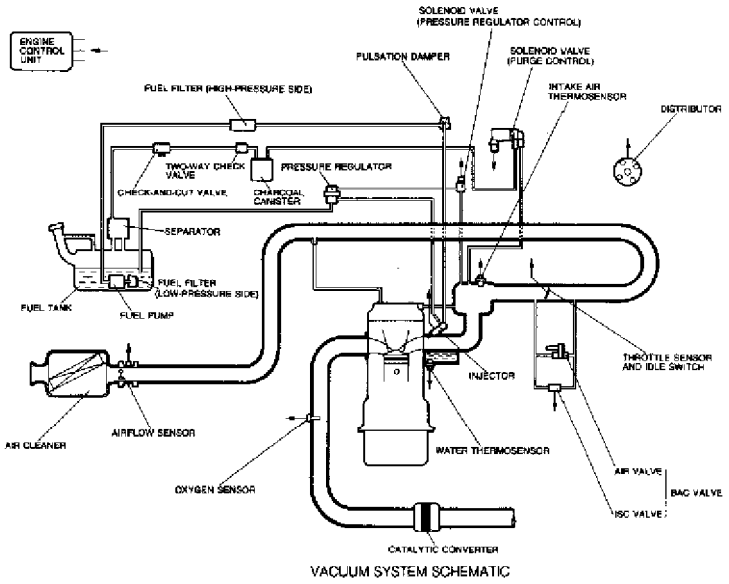


Fig. 7: Vacuum System Schematic (MPV 2.6L)
Courtesy Of Mazda Motors Corp.

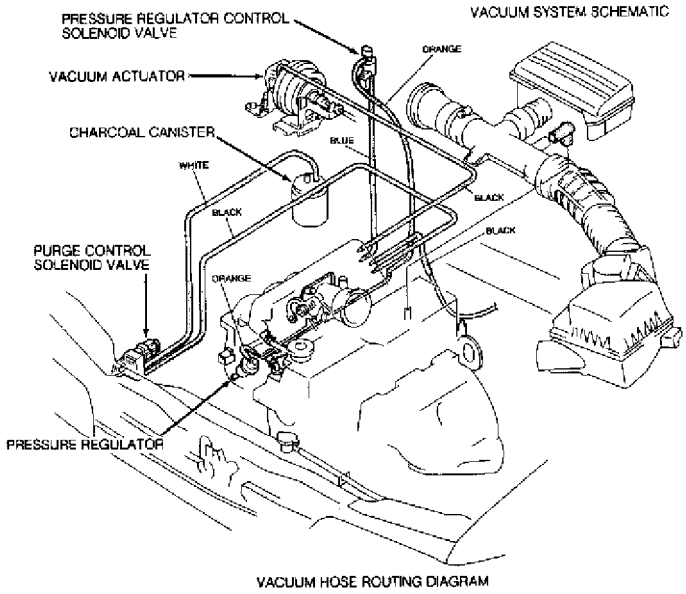


Fig. 8: Vacuum Hose Routing Diagram (MPV 2.6L)
Courtesy Of Mazda Motors Corp.

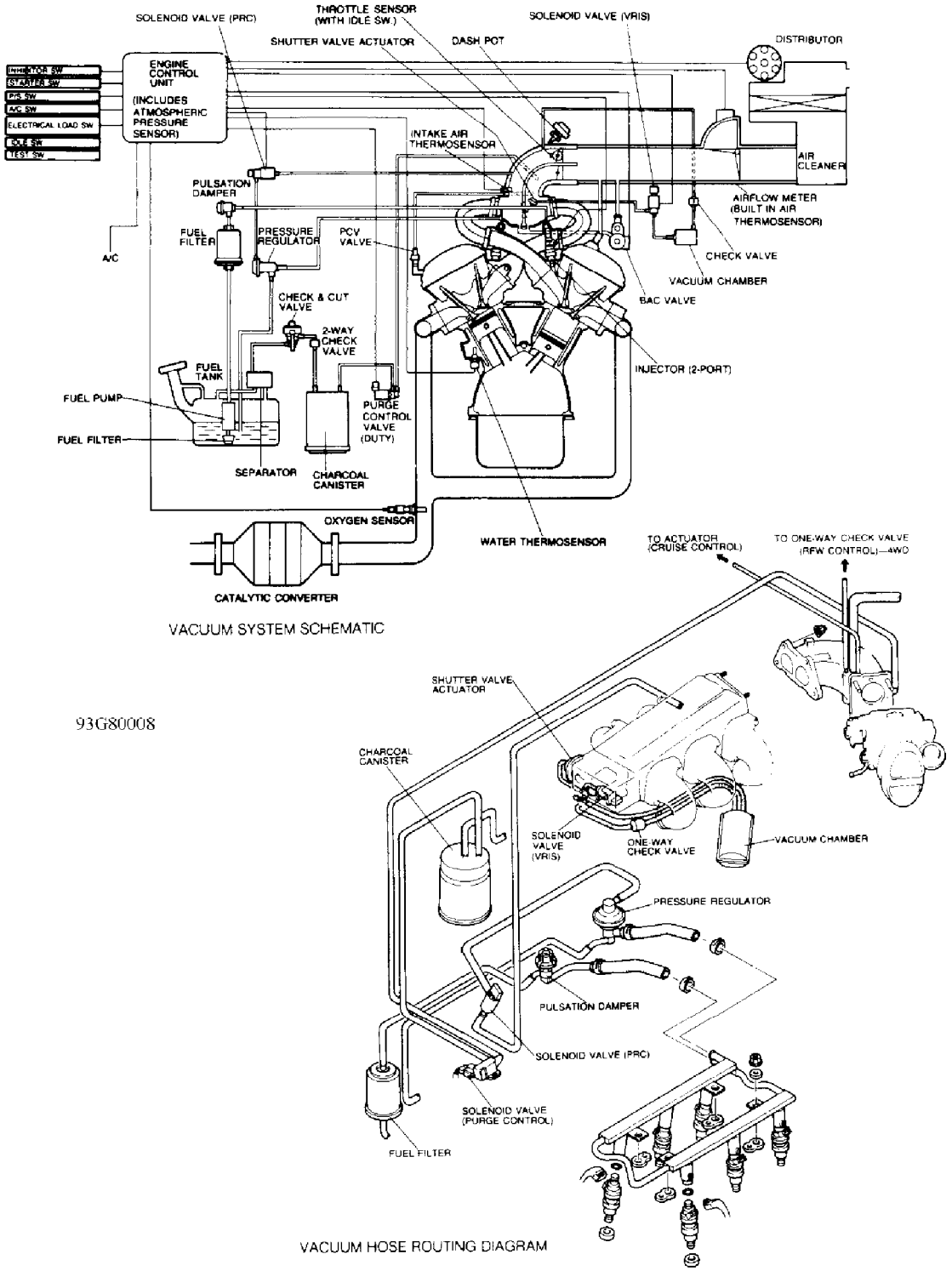
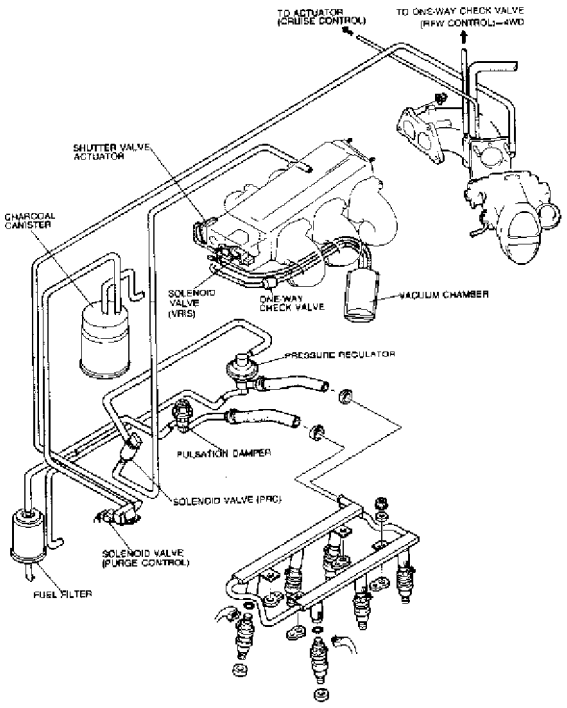


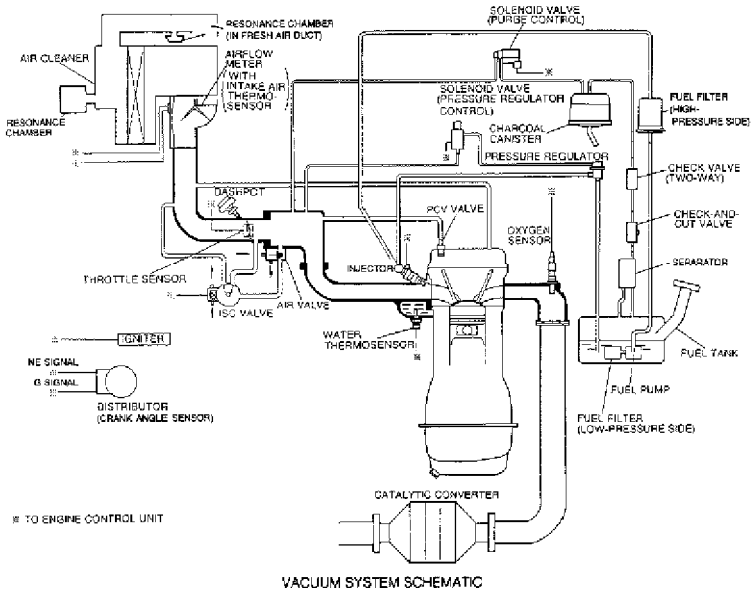
Fig. 9: Vacuum System Schematic (MPV 3.0L)
Courtesy Of Mazda Motors Corp.



VACUUM HOSE ROUTING DIAGRAM

92E24970

Fig. 10: Vacuum Hose Routing Diagram (MPV 3.0L)
Courtesy Of Mazda Motors Corp.



VACUUM SYSTEM SCHEMATIC

92F24971

Fig. 11: Vacuum System Schematic (MX-3 1.6L)
Courtesy Of Mazda Motors Corp.

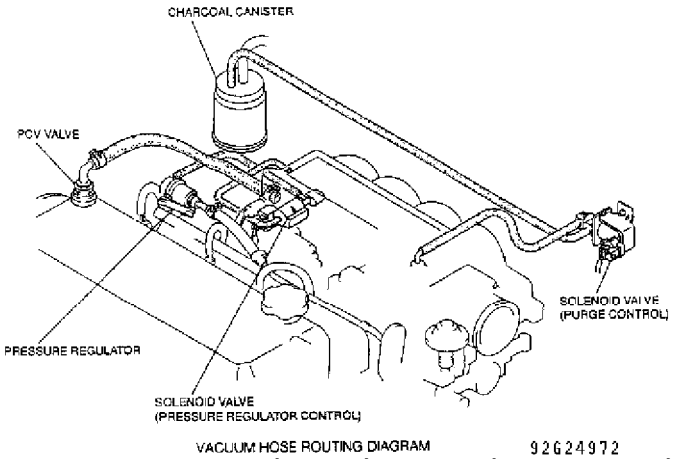


Fig. 12: Vacuum Hose Routing Diagram (MX-3 1.6L)
Courtesy Of Mazda Motors Corp.

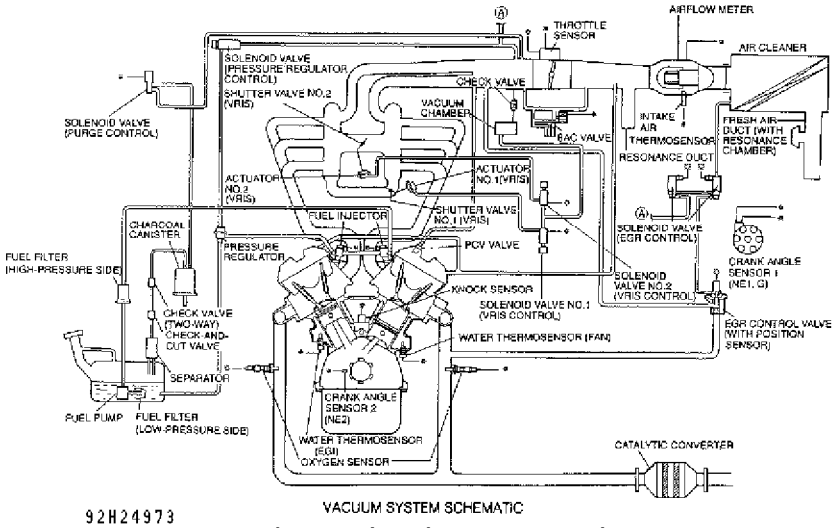


Fig. 13: Vacuum System Schematic (MX-3 1.8L)
Courtesy Of Mazda Motors Corp.

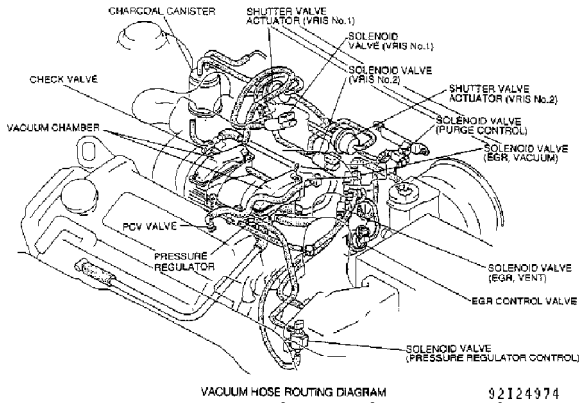


Fig. 14: Vacuum Hose Routing Diagram (MX-3 1.8L)
Courtesy Of Mazda Motors Corp.

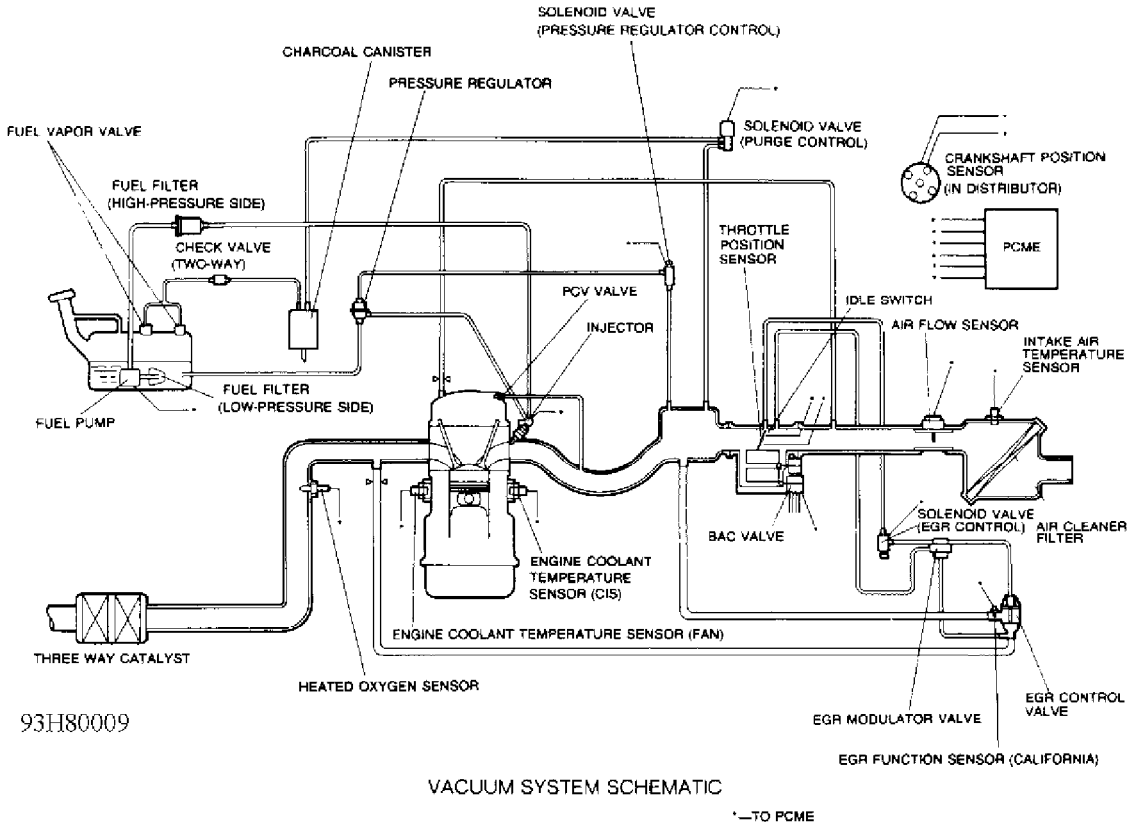


Fig. 15: Vacuum System Schematic (MX-6 2.0L & 626 2.0L)
Courtesy Of Mazda Motors Corp.

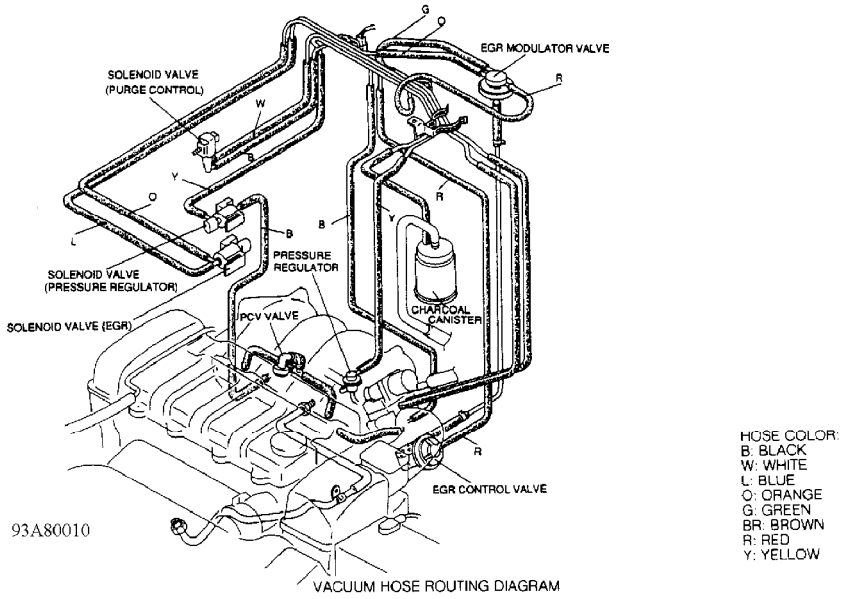


Fig. 16: Vacuum Hose Routing Diagram (MX-6 2.0L & 626 2.0L)
Courtesy Of Mazda Motors Corp.

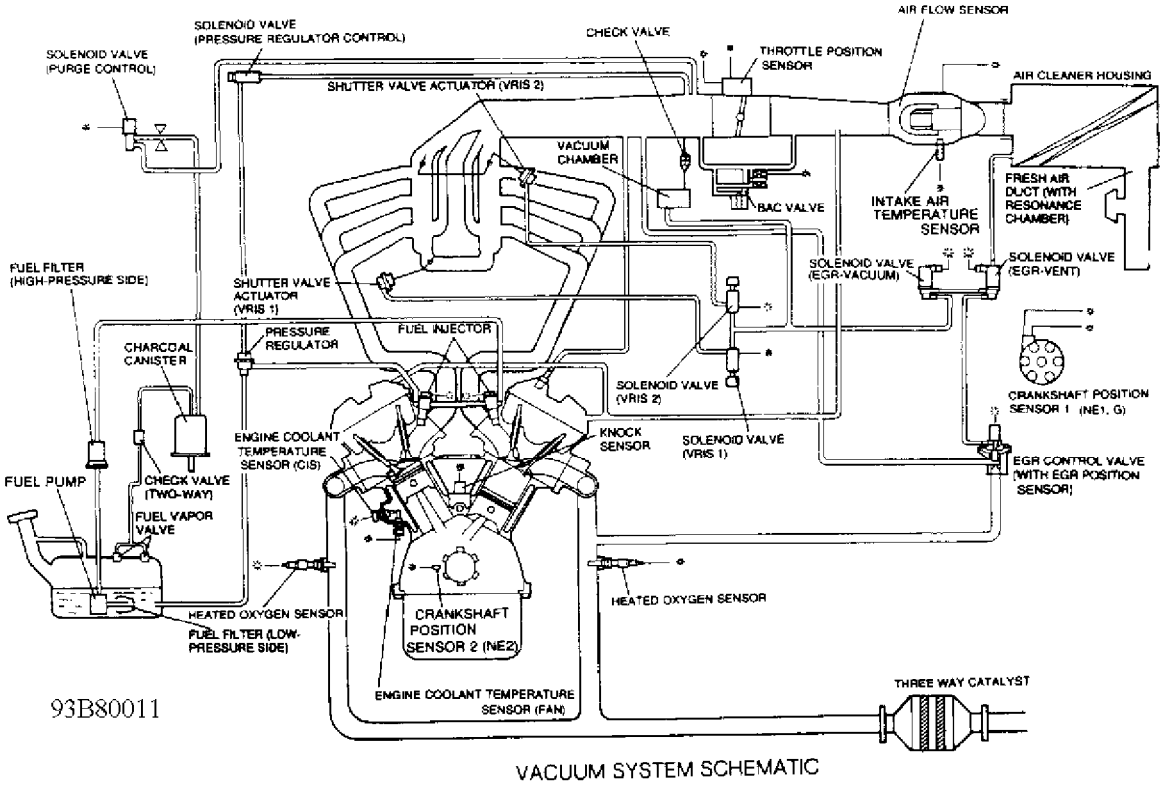


Fig. 17: Vacuum System Schematic (MX-6 2.5L & 626 2.5L)
Courtesy Of Mazda Motors Corp.

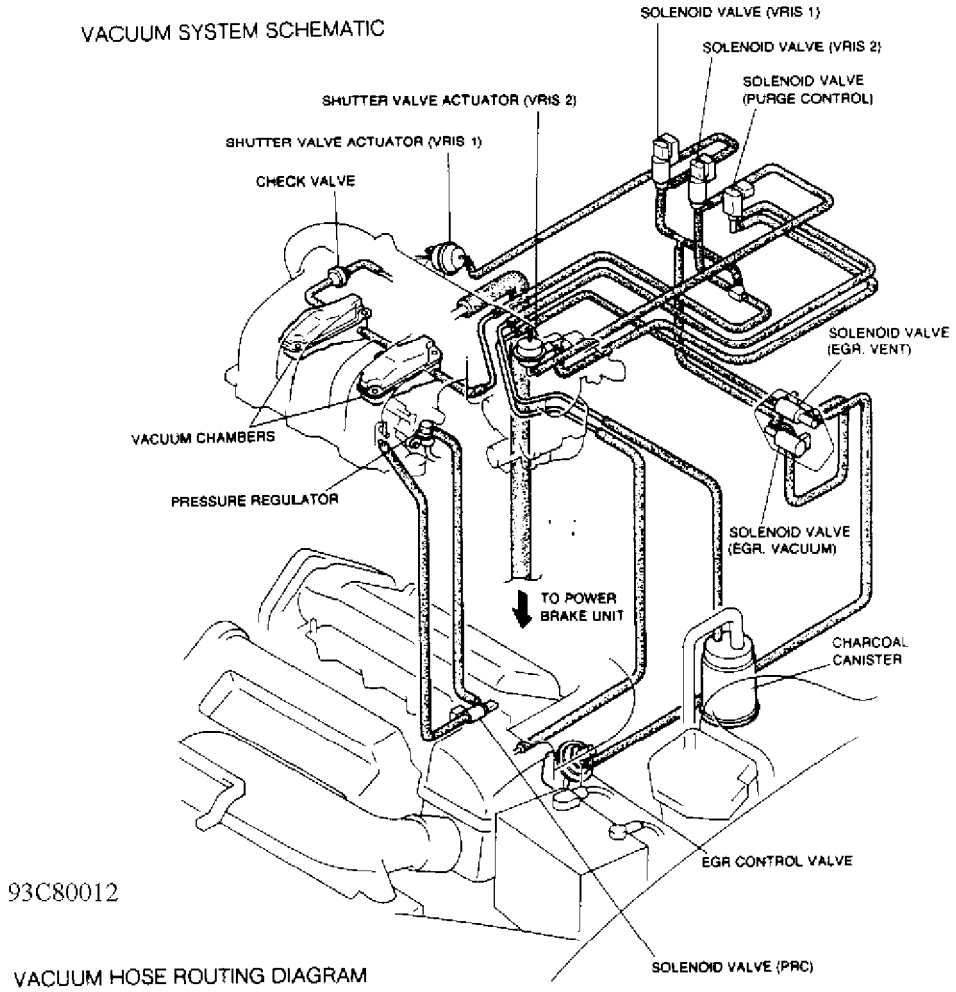
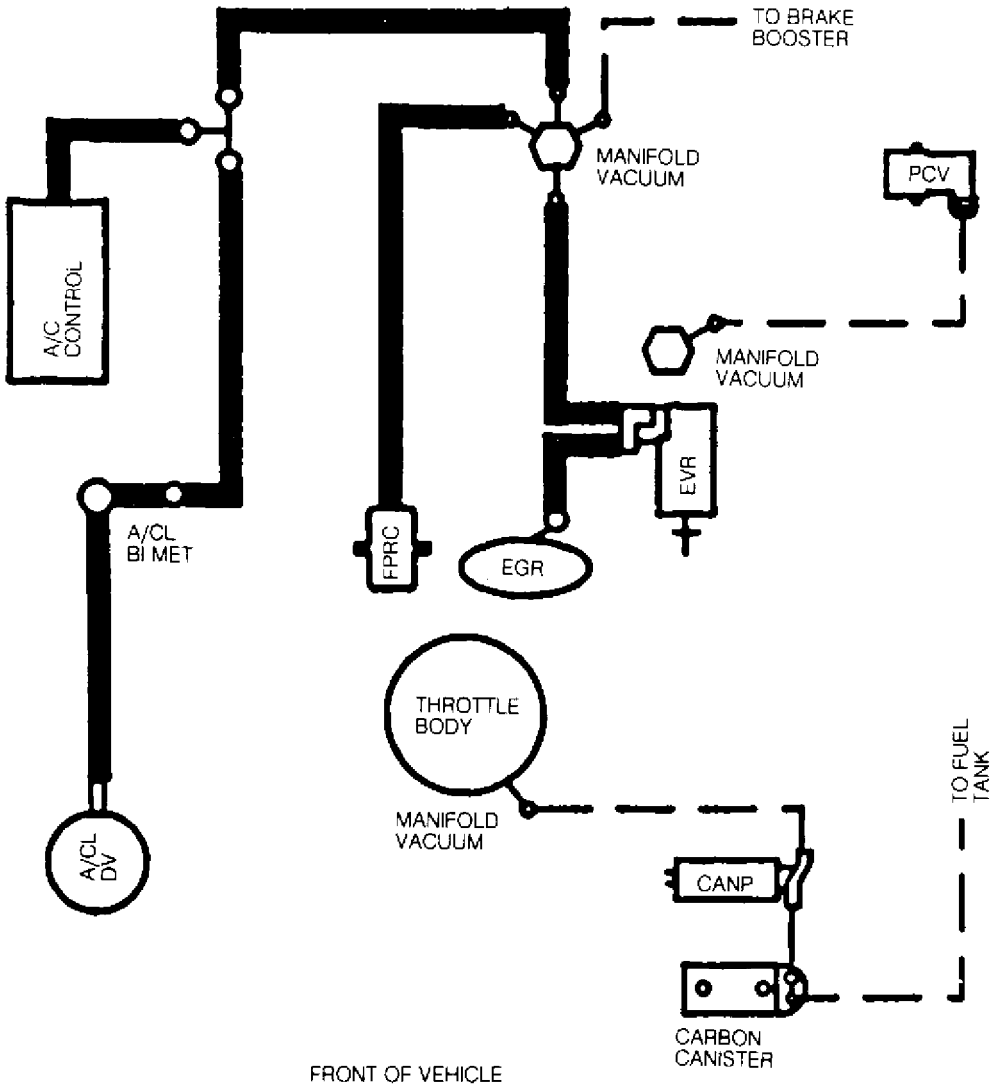


Fig. 18: Vacuum Hose Routing Diagram (MX-6 2.5L & 626 2.5L)
Courtesy Of Mazda Motors Corp.

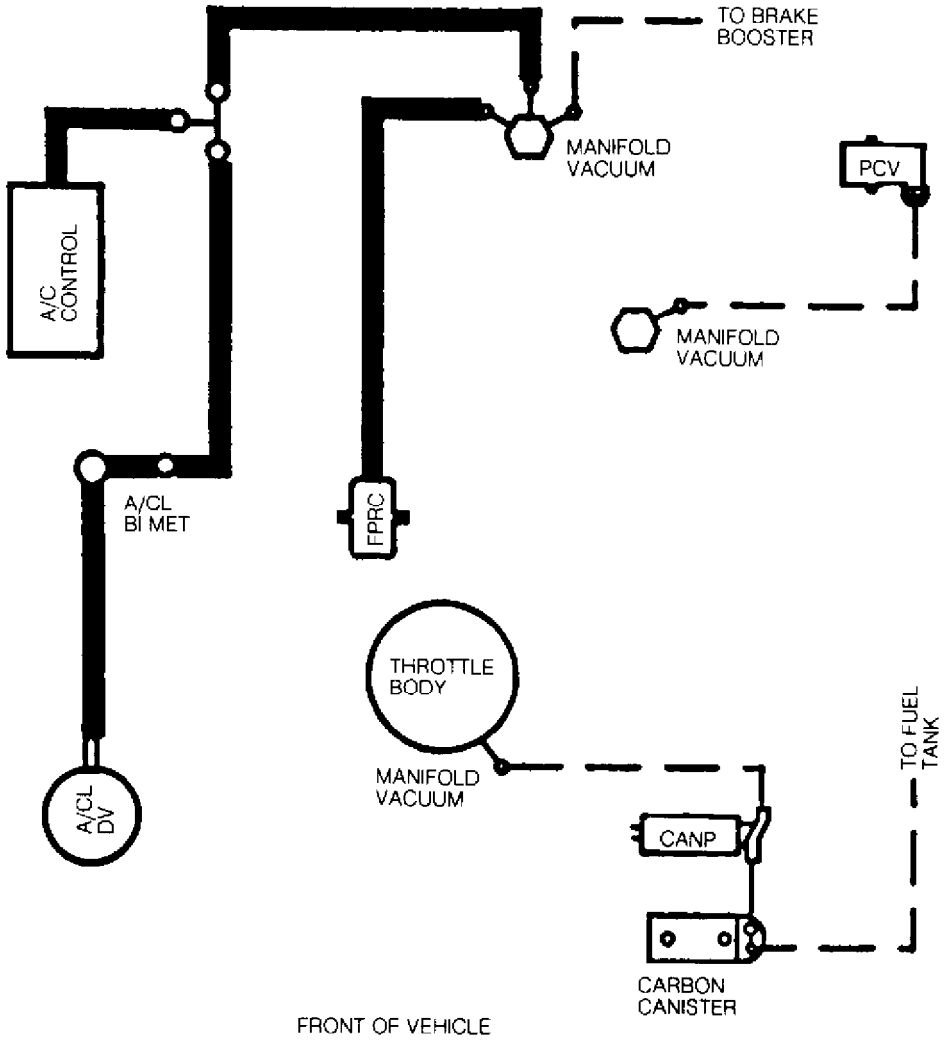


EMISSION CONTROL DEVICE ABBREVIATIONS

A/CL-BI MET - AIR CLEANER BI-METALLIC SENSOR
A/CL-DV - AIR CLEANER DUCT VALVE
CANP - CANISTER PURGE
EGR - EXHAUST GAS RECIRCULATION
EVR - EGR VACUUM REGULATOR
FPRC - FUEL PRESSURE REGULATOR CONTROL
PCV - POSITIVE CRANKCASE VENTILATION

93D80013 VACUUM HOSE ROUTING DIAGRAM

Fig. 19: Vacuum Hose Routing Diagram (Navajo 4.0L California)
Courtesy Of Ford Motor Co.



EMISSION CONTROL DEVICE ABBREVIATIONS

A/CL-BI MET - AIR CLEANER BI-METALLIC SENSOR
A/CL-DV - AIR CLEANER DUCT VALVE
CANP - CANISTER PURGE
FPRC - FUEL PRESSURE REGULATOR CONTROL
PCV - POSITIVE CRANKCASE VENTILATION

VACUUM HOSE ROUTING DIAGRAM

93E80014

Fig. 20: Vacuum Hose Routing Diagram (Navajo 4.0L Federal)
Courtesy Of Ford Motor Co.

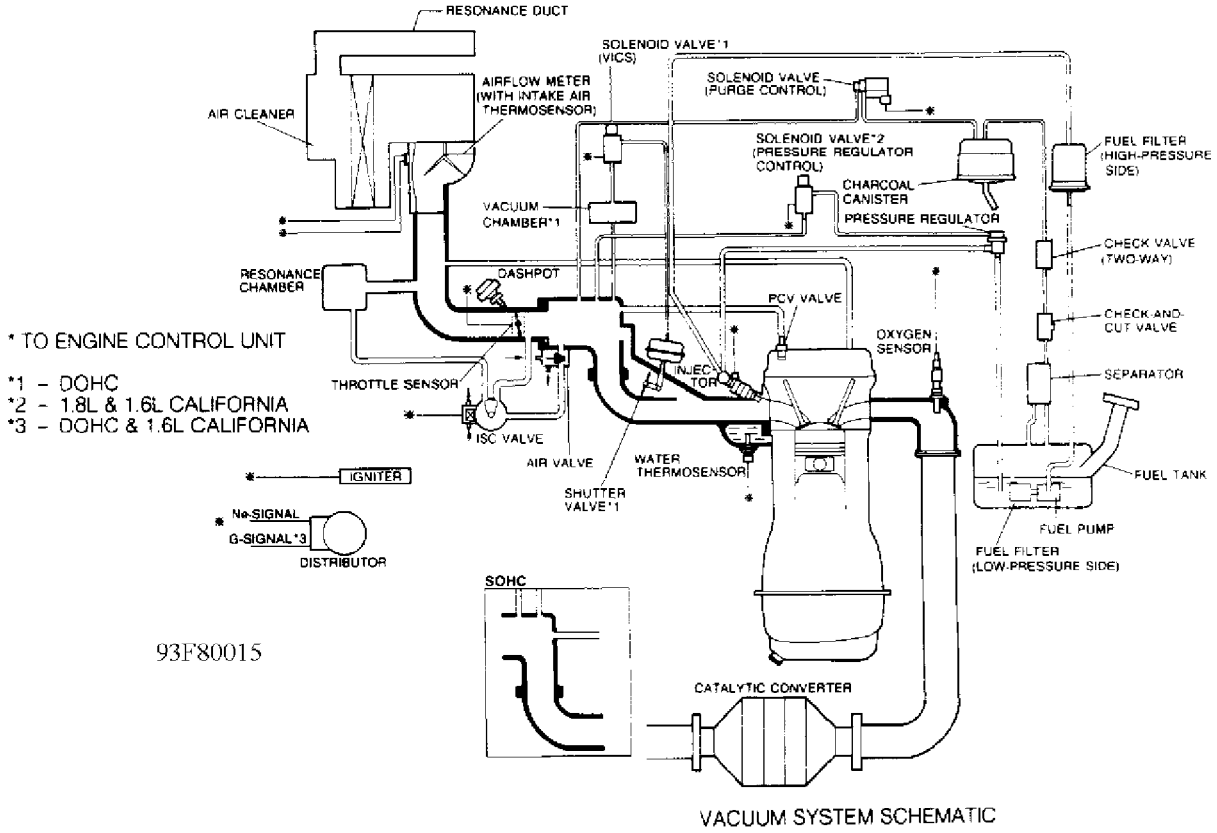
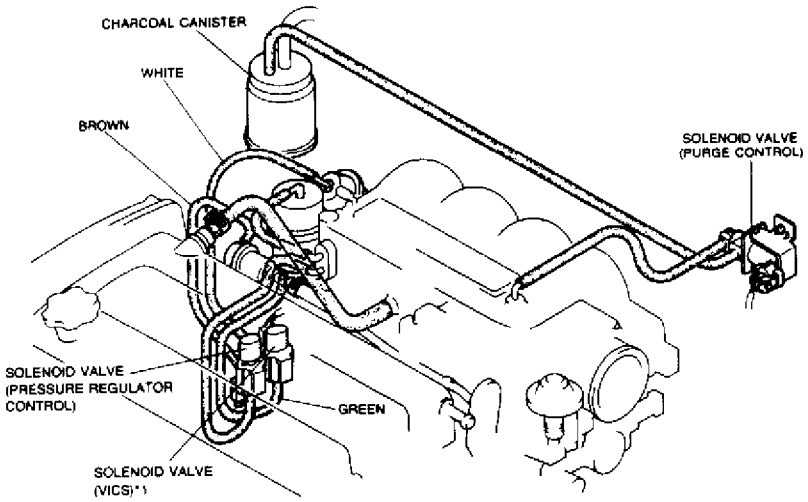
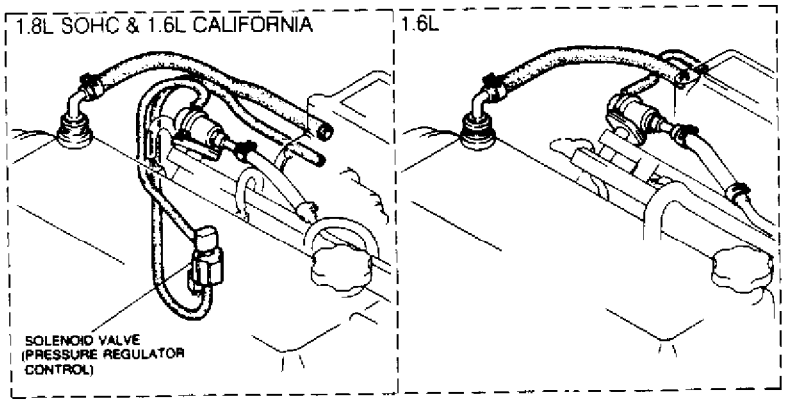


Fig. 21: Vacuum System Schematic (Protege 1.8L & 323 1.6L)
Courtesy Of Mazda Motors Corp.



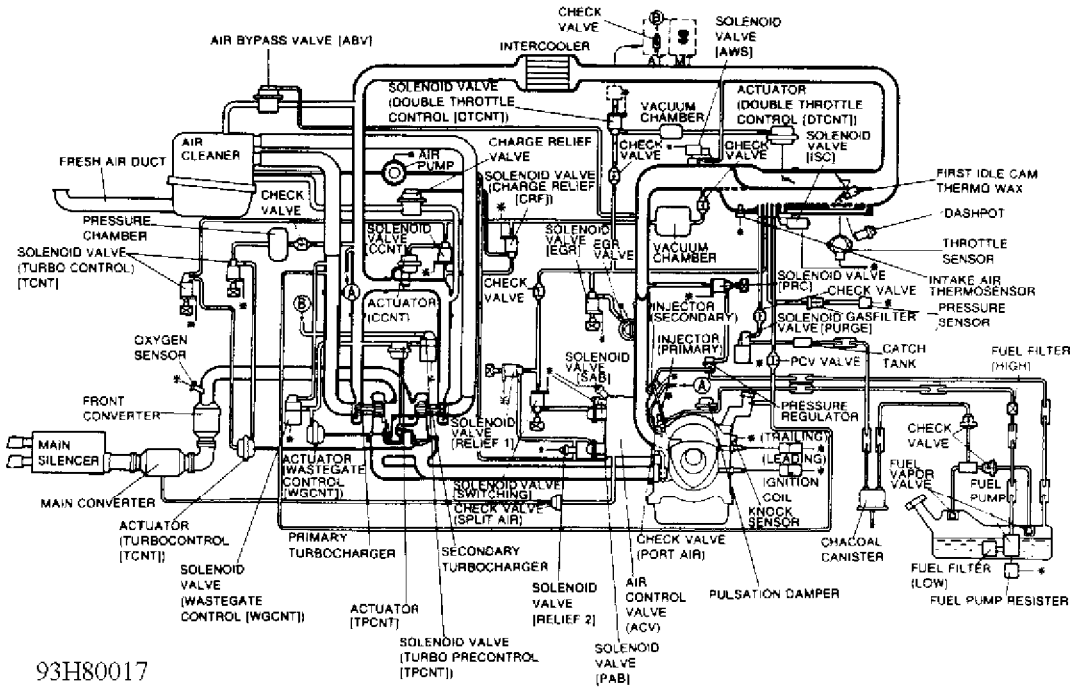
*1 - DOHC

VACUUM HOSE ROUTING DIAGRAM



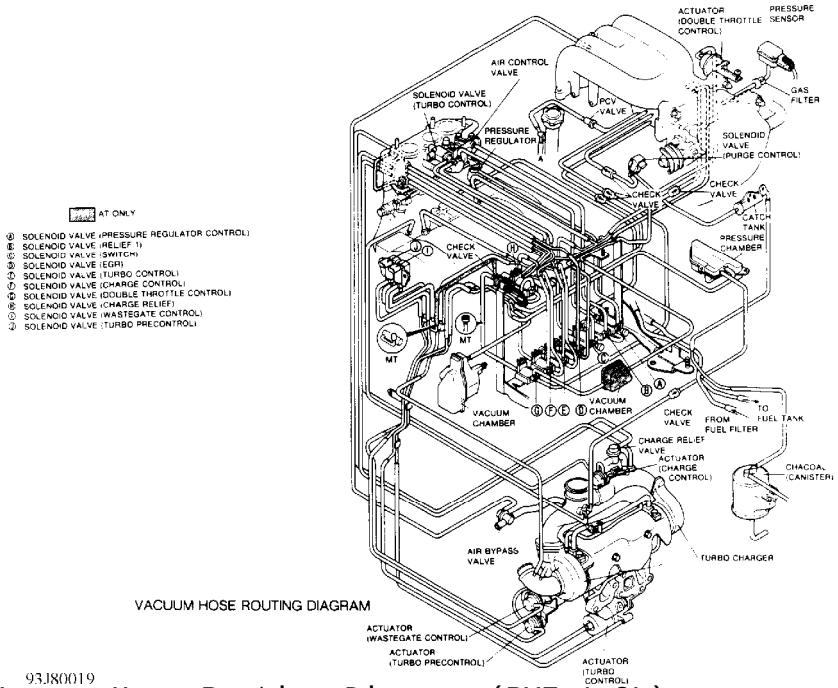
93G80016

Fig. 22: Vacuum Hose Routing Diagram (Protege 1.8L & 323 1.6L)
Courtesy Of Mazda Motors Corp.



VACUUM SYSTEM SCHEMATIC

Fig. 23: Vacuum System Schematic (RX7 1.3L)
Courtesy Of Mazda Motors Corp.



VACUUM HOSE ROUTING DIAGRAM

Fig. 24: Vacuum Hose Routing Diagram (RX7 1.3L)
Courtesy Of Mazda Motors Corp.

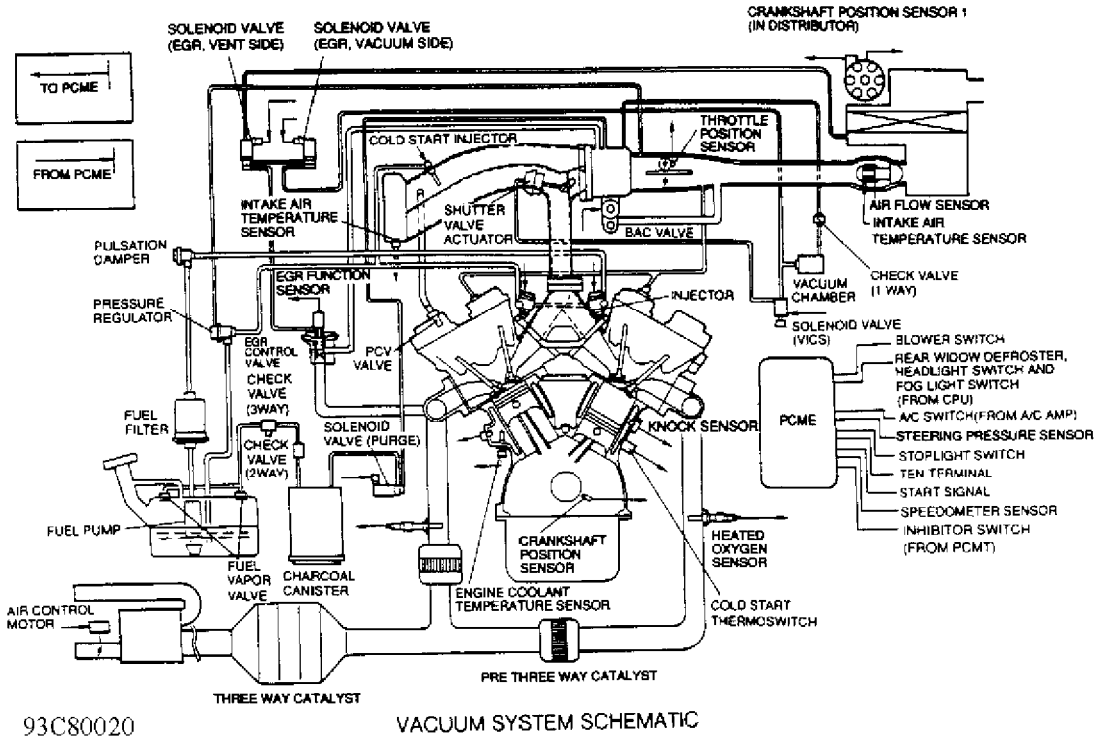
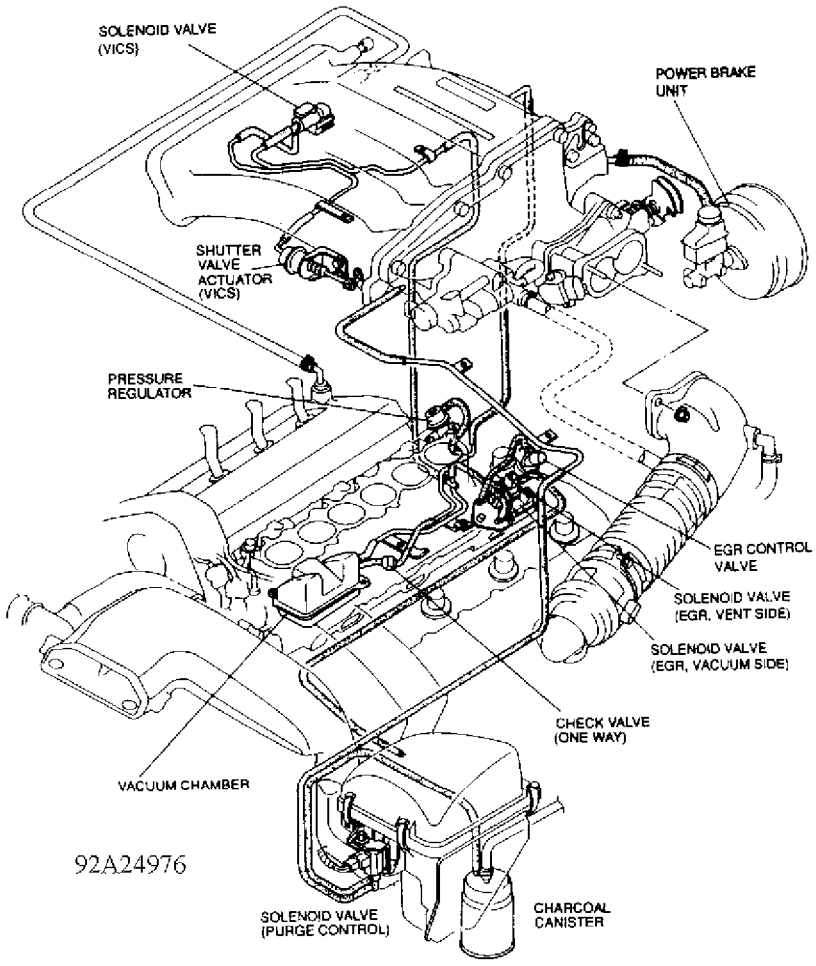


Fig. 25: Vacuum System Schematic (929 3.0L)
Courtesy Of Mazda Motors Corp.



VACUUM HOSE ROUTING DIAGRAM

Fig. 26: Vacuum Hose Routing Diagram (929 3.0L)
Courtesy Of Mazda Motors Corp.

END OF ARTICLE

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Mazda Removal, Overhaul & Installation

B2200, B2600i, Miata, MPV, MX-3, MX-6,
Navajo, Protege, RX7, 323, 626 & 929

INTRODUCTION

Removal, overhaul and installation procedures are covered in this article. If component removal and installation is primarily an unbolt and bolt-on procedure, only a torque specification may be furnished.

NOTE: On Miata, obtain code number and deactivate anti-theft alarm before disconnecting battery cable.

IGNITION SYSTEM

DISTRIBUTOR

NOTE: Miata, Navajo and RX7 are equipped with distributorless ignition system.

Refer to appropriate illustration when removing, overhauling or installing distributor. See Figs. 1-7.

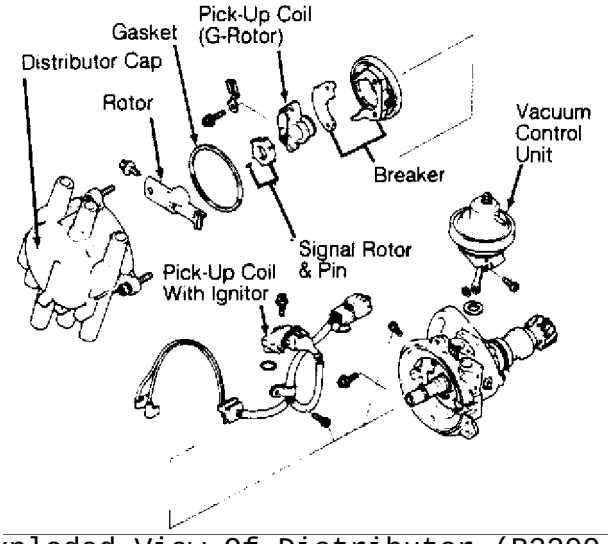


Fig. 1: Exploded View Of Distributor (B2200 Carbureted)
Courtesy of Mazda Motors Corp.

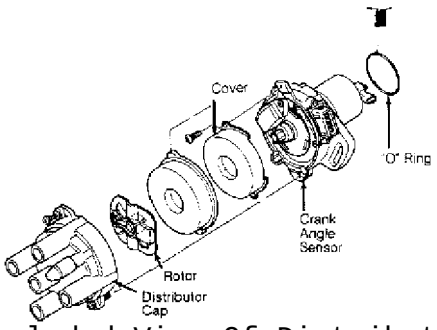


Fig. 2: Exploded View Of Distributor (B2200 PFI, B2600i, MPV 2.6L, Protege & 323)
Courtesy of Mazda Motors Corp.

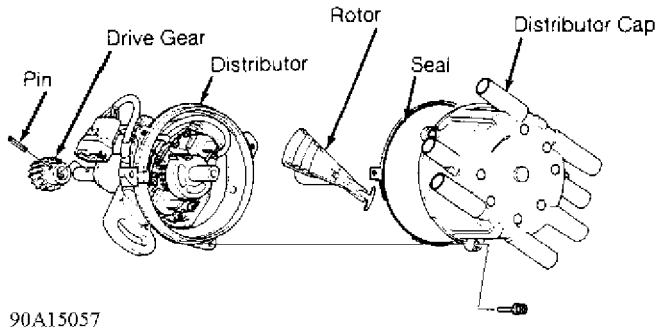


Fig. 3: Exploded View Of Distributor (MPV 3.0L)
Courtesy of Mazda Motors Corp.

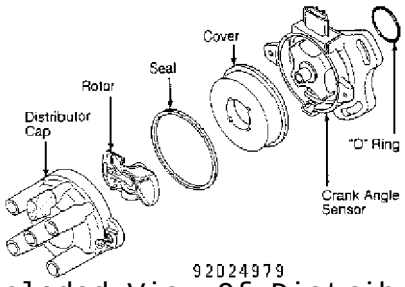


Fig. 4: Exploded View Of Distributor (MX-3 1.6L)
Courtesy of Mazda Motors Corp.

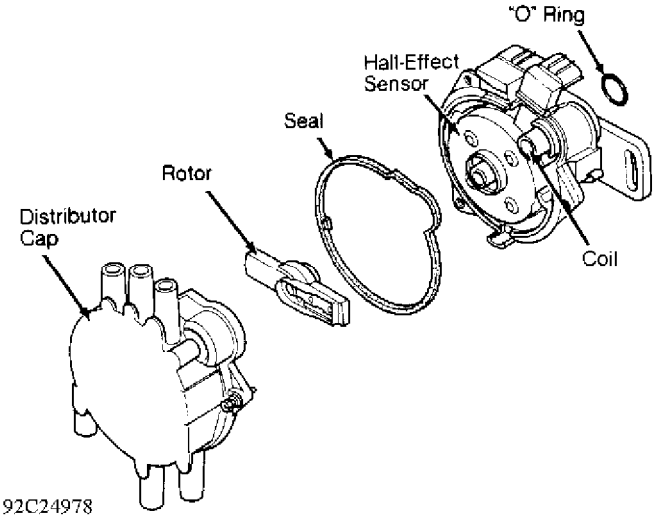


Fig. 5: Exploded View Of Distributor (MX-3 1.8L, MX-6 2.5L & 626 2.5L)
Courtesy of Mazda Motors Corp.

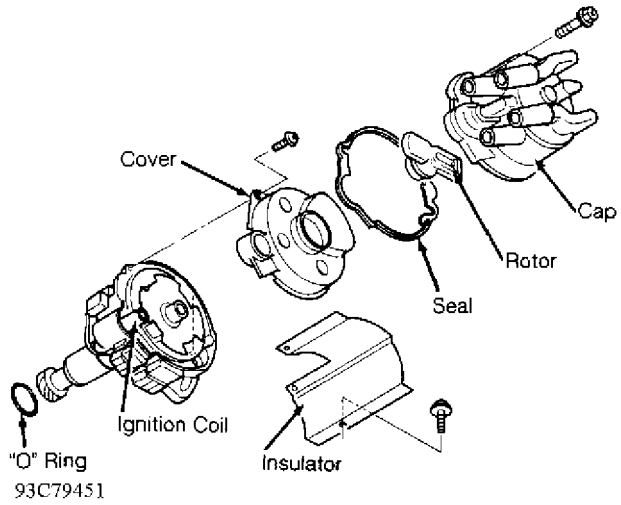


Fig. 6: Exploded View Of Distributor (MX-6 2.0L & 626 2.0L)
Courtesy of Mazda Motors Corp.

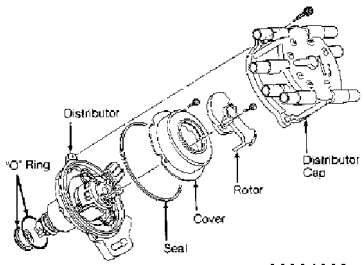


Fig. 7: Exploded View Of Distributor (929)
Courtesy of Mazda Motors Corp.

CRANK ANGLE SENSOR

Removal & Installation (Miata)

Disconnect sensor connector. Remove hold-down bolt. Remove sensor. To install, reverse removal procedure. Adjust ignition timing. See D - ADJUSTMENTS article. Tighten bolt to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

Removal & Installation (MX-3 1.8L, MX-6 2.5L & 626 2.5L)

Crank angle sensor is located on front of engine near crank pulley. To remove, disconnect negative battery cable. Remove idle pulley bracket. Remove dipstick pipe. Disconnect sensor connector. Remove sensor. To install, reverse removal procedure. Tighten bolts to specification. See TORQUE SPECIFICATIONS table. Adjust ignition timing. See D - ADJUSTMENTS article.

Removal & Installation (RX7)

Disconnect negative battery cable. Remove drive belt. Remove crankshaft pulley and crank angle sensor plate. Remove nuts and sensor bracket. Disconnect electrical connectors. Remove crank angle sensors. To install, reverse removal procedure. Tighten sensor mounting nuts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

Removal & Installation (929)

Crank angle sensor is located on front of engine, near crank pulley. To remove, disconnect sensor connector. Remove mounting bolt. Remove sensor. To install, reverse removal procedure. Adjust ignition timing. See D - ADJUSTMENTS article. Tighten bolt to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

CRANKSHAFT POSITION SENSOR

Removal & Installation (Navajo)

Disconnect negative battery cable. Disconnect crankshaft position sensor connector. See Fig. 8. Remove crankshaft timing sensor mounting screws, and remove sensor. To install, reverse removal procedure. Tighten screws to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

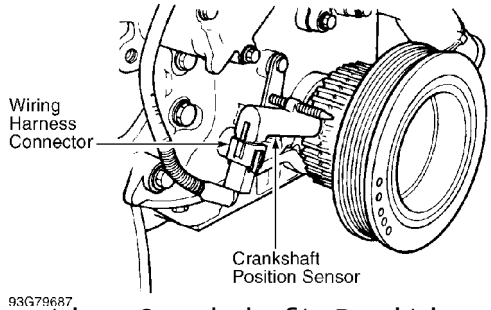


Fig. 8: Locating Crankshaft Position Sensor (Navajo)
Courtesy of Ford Motor Co.

FUEL SYSTEM

WARNING: Always relieve fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact engine or electrical components.

FUEL SYSTEM PRESSURE RELEASE

Except Navajo

1) Start engine. On B2200 PFI, B2600i, Miata,MX-6, RX7, 626 and 929, disconnect fuel pump relay or circuit opening relay. See FUEL PUMP/CIRCUIT OPENING RELAY LOCATION table.

2) On MPV 3.0L, disconnect airflow sensor connector. On all other models, disconnect fuel pump connector near fuel tank (on MX-3, Protege and 323, fuel pump connector is accessible from under rear seat cushion).

3) On all models, allow engine to run until it stalls. Turn ignition off. Reconnect electrical connector.

FUEL PUMP/CIRCUIT OPENING RELAY LOCATION TABLE

Application	Location
B2200 PFI & B2600i	Behind Left Kick Panel
Miata	Left Of Steering Column
MX-6 & 626	Underhood Relay Panel
Protege & 323	Below Glove Box
RX7 & 929	Underhood Fuse Block

Navajo

1) Disconnect negative battery cable. Remove snow/ice shield. Remove air intake tube between air cleaner and throttle body. Remove fuel filler cap to release fuel tank pressure. Connect Fuel Pressure Gauge (49-UN01-010) to fuel pressure relief valve (Schrader valve) on fuel supply manifold, near fuel pressure regulator. See Fig. 25.

2) As an alternate method, disconnect inertia switch connector behind instrument panel, under radio. Start engine and operate until it stalls.

FUEL LINE CONNECTORS (NAVAJO)

NOTE: Although push-connect fittings and spring lock couplers are similar in function, different procedures and tools are used to disconnect and connect these connectors. See Figs. 9 and 10.

Disconnect (Push-Connect Fitting)

1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Remove locking (safety) clip (if equipped).

2) Position Push-Connect Fitting Releaser (49-UN01-053 for 5/16" line; 49-UN01-054 for 3/8" line) over fuel line. See Fig. 9.

Slide releaser into fitting. Pull fuel lines apart.

Connect

Press fuel lines together until a click is heard. Attempt to pull lines apart to ensure coupler is fully engaged. Install locking clip (if equipped).

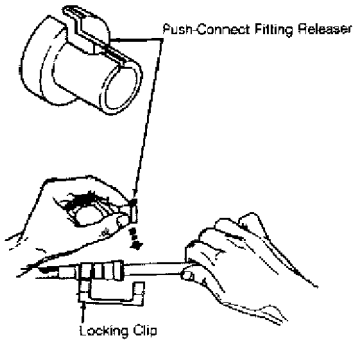


Fig. 9: Disconnecting Push-Connect Fitting (Navajo)
Courtesy of Ford Motor Co.

Disconnect (Spring Lock Coupler)

1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Remove locking (safety) clip (if equipped). Place Spring Lock Coupler Releaser (49-UN01-051 for 3/8" line; 49-UN01-052 for 1/2" line) over fuel line coupler. See Fig. 10.

2) Push spring lock coupler releaser to release female fitting from garter spring. Pull spring lock coupler apart. Remove releaser.

Connect (Spring Lock Coupler)

1) Check for damaged garter spring. If garter spring is damaged, remove using small hooked wire and replace spring. Wipe end of lines using clean cloth. Place new "O" rings onto tube. Lubricate ends of lines with clean refrigerant oil.

2) Push fitting together using a slight twisting motion. Ensure garter spring is over flared end of female fitting. Attempt to pull lines apart to ensure coupler is fully engaged. Install locking clip (if equipped).

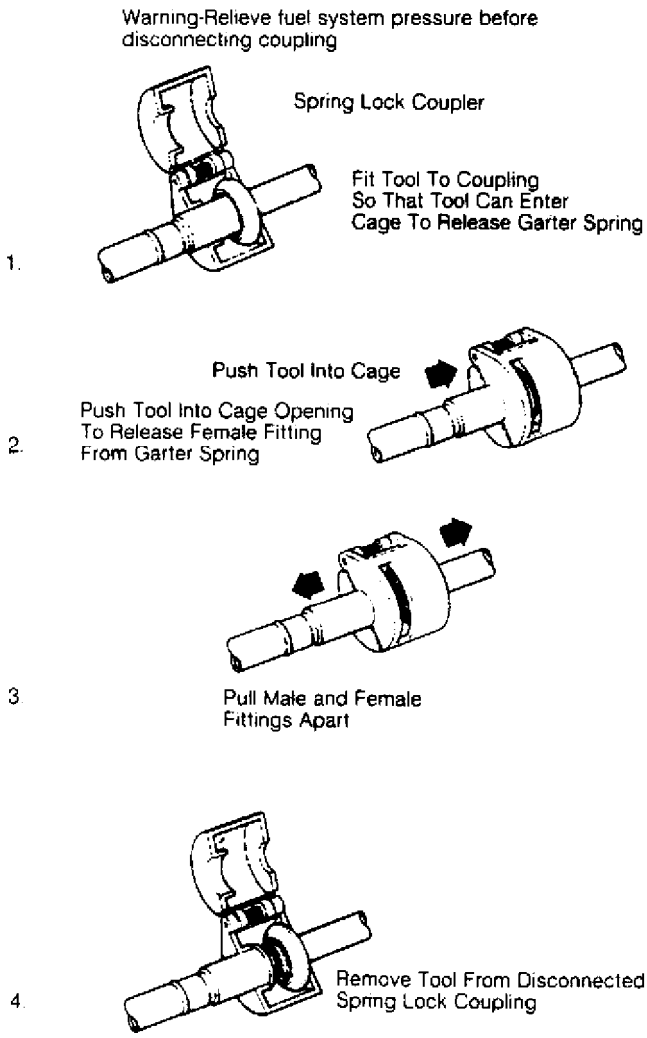


Fig. 10: Disconnecting Spring Lock Coupler (Navajo)
Courtesy of Ford Motor Co.

FUEL SYSTEM PRIMING

CAUTION: After performing fuel system repairs, use following procedure to prime fuel system before starting engine . This prevents excessive engine cranking and allows system to be leak-tested.

Except Navajo

1) On B2200 PFI, B2600i, and MPV, connect jumper wire between terminals of Yellow 2-pin connector. See FUEL PUMP TEST CONNECTOR LOCATION table.

2) On all others, connect jumper wire between GND and F/P terminals of data link connector. See Fig. 11. On all models, turn ignition on for about 10 seconds and then off. Disconnect jumper wire.

Navajo

Without starting engine, turn ignition on and off 5-10 times.

FUEL PUMP TEST CONNECTOR LOCATION TABLE

Application	Location
B2200 PFI & B2600i	Right Rear Corner Of Engine Compartment
MPV	Left Front Corner Of Engine Compartment

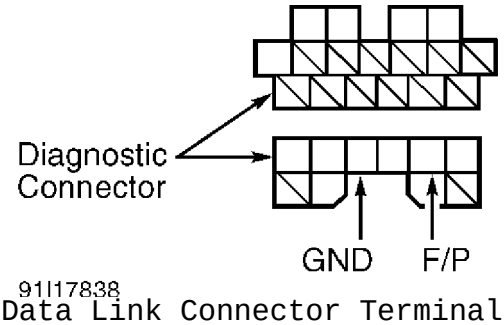


Fig. 11: Data Link Connector Terminal ID (Except B2200, B2600i, MPV & Navajo)
Courtesy of Mazda Motors Corp.

CARBURETOR (B2200)

Removal & Installation

Disconnect negative battery cable. Remove air cleaner. Disconnect accelerator cable, cruise control cable (if equipped), all necessary vacuum hoses, fuel hoses and electrical connectors. Remove carburetor mounting nuts. Remove carburetor. To install, reverse removal procedure.

Disassembly (Air Horn & Choke Assembly)

1) DO NOT remove choke valve and shaft from air horn. Disconnect vacuum hose from choke opener (pull-off) diaphragm. Remove accelerator pump connecting rod, spring and lever. See Fig. 22. Remove spring. Disconnect air vent solenoid valve wire from connector.

2) Disconnect choke rod. Remove air horn retaining bolts. Remove air horn and choke assembly from main body. Remove air vent solenoid valve, spring and gasket from air horn.

Disassembly (Needle Valve & Float)

Remove float, pin and gasket. See Figs. 15 and 22. Remove needle valve assembly. Remove sight glass assembly from main body.

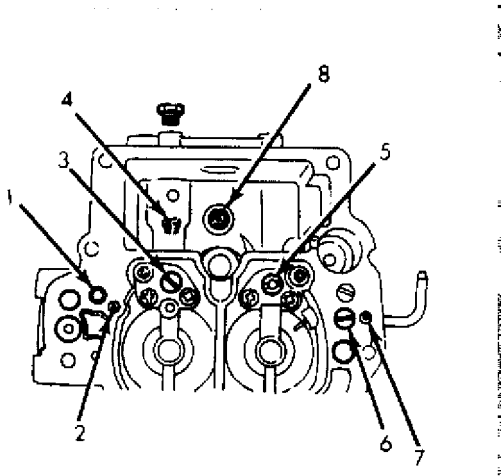
CAUTION: Note location and size of air bleeds and jets before removal. Ensure components are installed in correct locations.

Disassembly (Air Bleeds & Jets)

1) Remove secondary slow jet, secondary slow bleed, secondary main bleed and secondary main jet from main body. See Figs. 12 and 22.

Remove primary main bleed, slow jet and plug, primary slow bleed and primary main jet from main body.

2) Remove richer air bleed, primary slow bleed, coasting richer air bleed and coasting richer jet from air horn. See Figs. 13 and 22.



1. Secondary Slow Jet
2. Secondary Slow Bleed
3. Secondary Main Bleed
4. Secondary Main Jet
5. Primary Main Bleed
6. Slow Jet & Plug
7. Primary Slow Bleed
8. Primary Main Jet

Fig. 12: Locating Air Bleeds & Jets (Main Body)
Courtesy of Mazda Motors Corp.

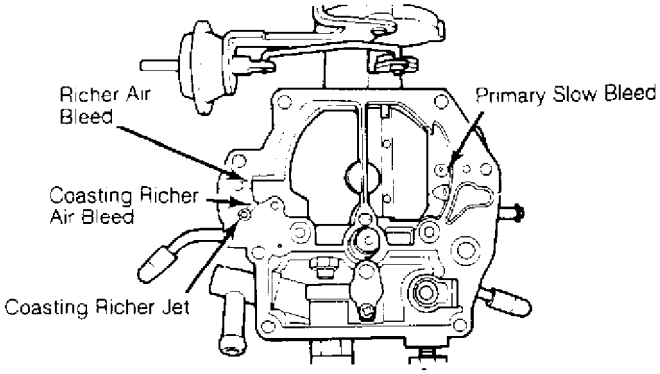


Fig. 13: Locating Air Bleeds & Jets (Air Horn)
Courtesy of Mazda Motors Corp.

Disassembly (Main Body)

1) DO NOT remove venturi's from main body. Remove coasting richer solenoid valve and "O" ring. See Fig. 22. Remove idle switch and spring. Remove slow fuel-cut solenoid valve, needle valve, spring and gasket. Remove dashpot (M/T).

2) Remove accelerator pump plunger and spring assembly. Remove retaining clip, strainer and inlet check ball. Remove outlet check ball plug, outlet check ball and spring.

3) Disconnect throttle link, vacuum diaphragm connecting rod

and throttle return spring. Remove throttle body-to-main body retaining bolts (one bolt is located inside throttle body). Separate throttle body from main body.

Disassembly (Throttle Body)

DO NOT remove throttle valve and shaft from throttle body. Remove vacuum (secondary) diaphragm assembly. Remove diaphragm cover screws. Remove cover, spring and diaphragm. Using small punch and hammer, remove spring pin located in front of mixture adjusting screw. Remove mixture adjusting screw.

NOTE: DO NOT immerse diaphragms, electrical components or synthetic parts in carburetor cleaner.

Cleaning & Inspection

1) Thoroughly clean metal parts in carburetor cleaner. Using compressed air, dry all components and blow out all passages. DO NOT use wire or pointed metal objects for cleaning. Inspect air horn, main body and throttle body for cracks.

2) Inspect choke shaft and throttle shaft for wear. Check all jets and air bleeds for open passages. Inspect needle and seat for wear. Inspect float and accelerator pump cup for damage. Replace all damaged components.

3) Inspect vacuum diaphragm for damage. Inspect idle mixture screw for wear and burrs. Apply battery voltage to solenoids to ensure solenoids operate (indicated by valve stem movement).

4) Check electric choke heater by connecting an ohmmeter to wire connector and heater ground. If continuity does not exist, replace electric choke heater.

5) To check Mixture Control (M/C) solenoid, apply battery voltage across solenoid using solenoid connector. See Fig. 14. From bottom of air horn, blow air through valve in direction indicated. If air does not flow through valve with solenoid energized, replace air horn assembly (M/C solenoid and air horn are replaced as an assembly).

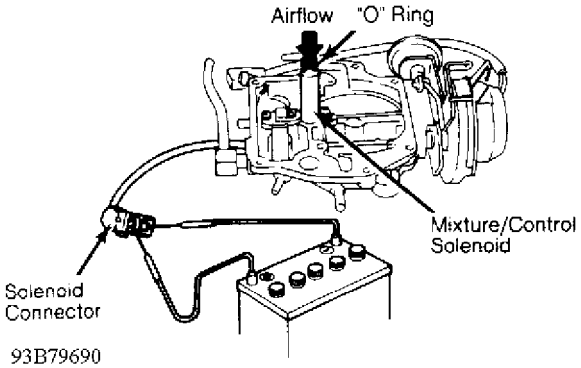


Fig. 14: Checking Mixture Control (M/C) Solenoid
Courtesy of Mazda Motors Corp.

Reassembly (All Parts)

1) To reassemble, reverse disassembly procedure using NEW gaskets. DO NOT install spring pin in front of mixture screw until idle mixture has been adjusted with engine running. Before installing air horn on main body, adjust float level and float drop. Install NEW "O" ring on M/C solenoid and coat "O" ring with gasoline.

2) After reassembly and before installing carburetor, adjust choke pull-off diaphragm, fast idle cam (throttle opening angle), fast idle cam (choke opening angle), choke unloader, secondary throttle valve and accelerator cable.

3) After installing carburetor, adjust curb (hot) idle speed, fast (cold) idle speed and idle mixture. See D - ADJUSTMENTS article.

Adjusting Float Level

With air horn upside-down and gasket removed, allow float to hang by its weight. Measure distance between top of float and air horn gasket surface. See Fig. 15. If distance is not .42-.46" (10.7-11.7 mm) on A/T models or .46-.50" (11.7-12.7 mm) on M/T models, bend float seat as necessary.

Adjusting Float Drop

With air horn upright and gasket removed, allow float to hang by its weight. Measure between bottom of float and air horn gasket surface. See Fig. 16. If distance is not 1.81-1.85" (46.0-47.0 mm), bend float stop as necessary. See Fig. 15.

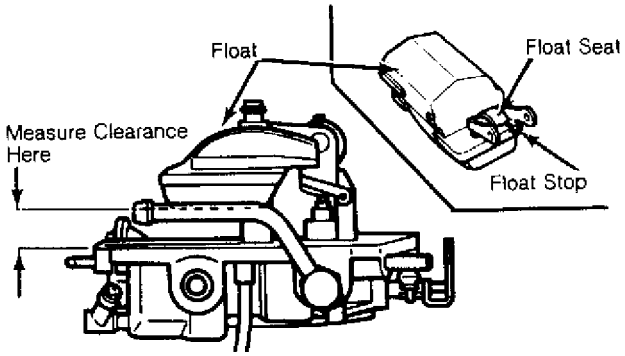


Fig. 15: Adjusting Float Level
Courtesy of Mazda Motors Corp.

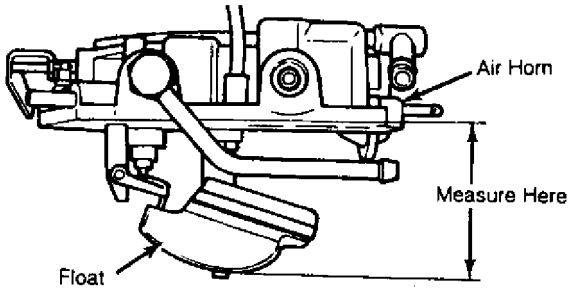


Fig. 16: Adjusting Float Drop
Courtesy of Mazda Motors Corp.

Adjusting Choke Pull-Off Diaphragm

Apply about 16 in. Hg vacuum to choke pull-off diaphragm. Lightly push choke plate toward closed position. Measure clearance between top of choke plate and air horn. See Fig. 17. If clearance is not .067-.085" (1.70-2.16 mm), bend choke lever until clearance is within specification.

Adjusting Fast Idle Cam (Throttle Opening Angle)

Set fast idle cam on second highest position. Measure between primary throttle valve and throttle bore. See Fig. 18. If clearance is not .033-.041" (0.84-1.04 mm), turn fast idle adjusting screw as necessary.

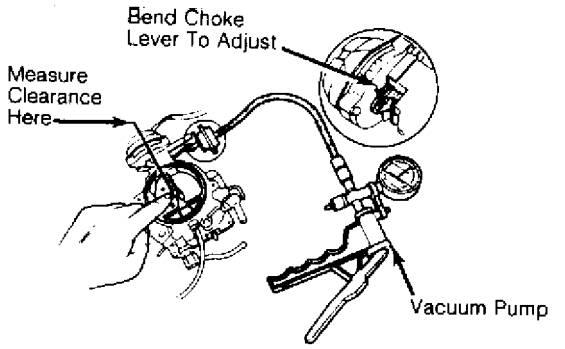


Fig. 17: Adjusting Choke Pull-Off Diaphragm
Courtesy of Mazda Motors Corp.

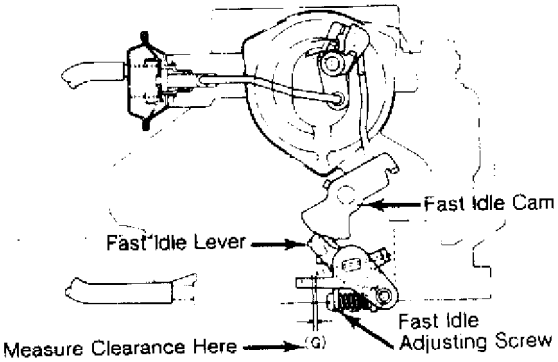


Fig. 18: Adjusting Fast Idle Cam (Throttle Valve Angle)
Courtesy of Mazda Motors Corp.

Adjusting Fast Idle Cam (Choke Valve Angle)

Set fast idle cam on second highest position. Measure clearance between top of choke plate and air horn. See Fig. 19. If clearance is not .024-.045" (0.60-1.14 mm), bend starting arm. If large adjustment is required, bend choke rod.

Adjusting Choke Unloader

Fully open primary throttle valve. Measure clearance between top of choke plate and air horn. See Fig. 20. If clearance is not . 110-.143" (2.80-3.62 mm), bend tab as necessary.

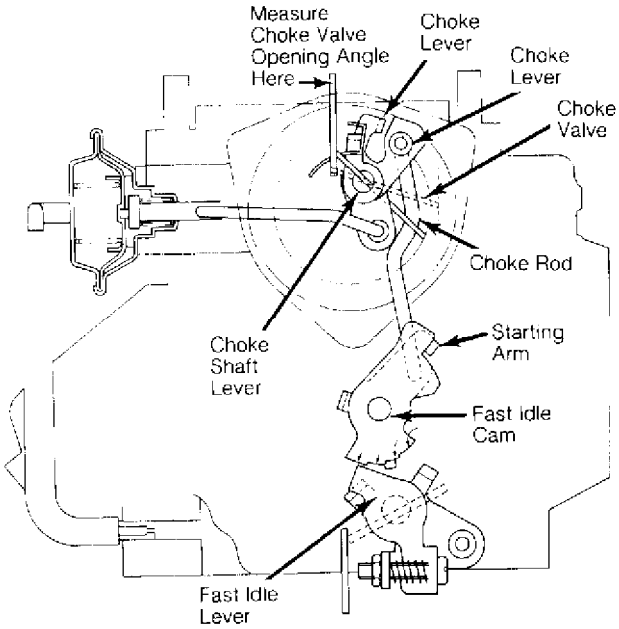


Fig. 19: Adjusting Fast Idle Cam (Choke Opening Angle)
Courtesy of Mazda Motors Corp.

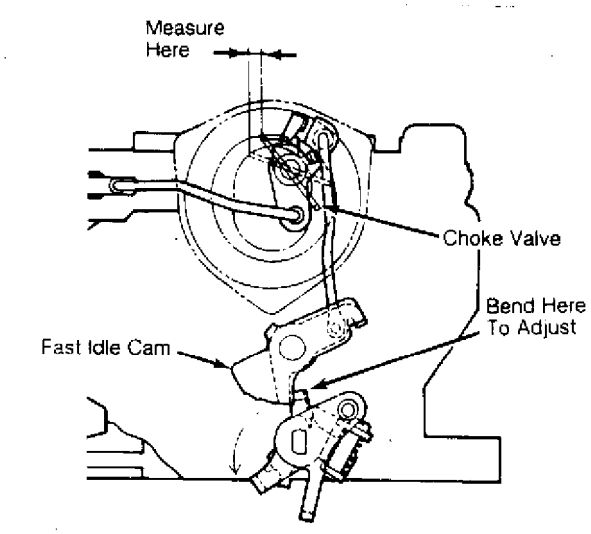


Fig. 20: Adjusting Choke Unloader
Courtesy of Mazda Motors Corp.

Adjusting Secondary Throttle Valve

Secondary throttle valve should start to open when primary throttle valve opens 50-54 degrees and should be fully open when primary throttle valve is fully open. Measure clearance between primary throttle valve and throttle bore when secondary throttle valve starts to open. See Fig. 21. If clearance is not .289-.325" (7.35-8.25 mm), bend tab as necessary.

Adjusting Accelerator Cable

Check accelerator cable deflection (free play) at carburetor. If deflection is not .039-.118" (1.0-3.0 mm), turn cable adjusting nuts as needed. Fully depress accelerator pedal. If primary throttle valve does not fully open, turn accelerator stop bolt (above accelerator pedal) as needed to obtain full valve opening.

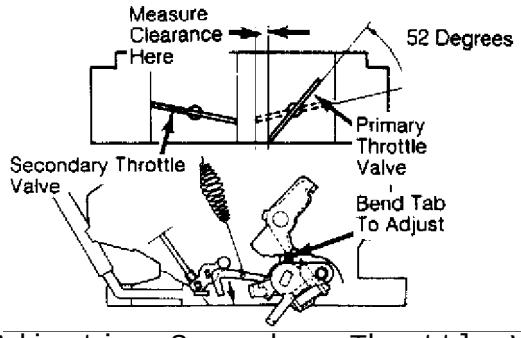


Fig. 21: Adjusting Secondary Throttle Valve
Courtesy of Mazda Motors Corp.

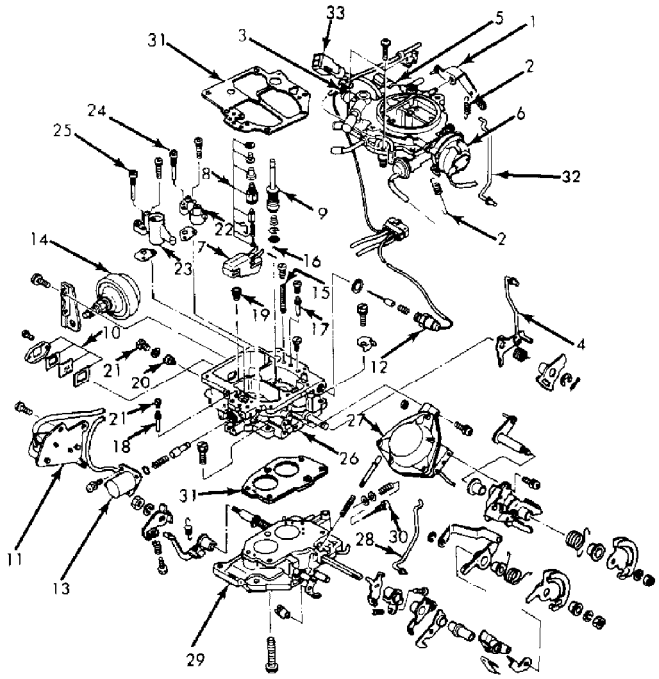


Fig. 22: Exploded View Of 2-Barrel Carburetor (B2200)
Courtesy of Mazda Motors Corp.

FUEL PUMP

CAUTION: After performing fuel system repairs, prime fuel system before starting engine. See FUEL SYSTEM PRIMING.

Removal (B2200 Carbureted With Electric Pump, B2200 PFI & B2600i)

Release fuel system pressure (except B2200 Carbureted). See FUEL SYSTEM PRESSURE RELEASE. Remove fuel tank. Remove fuel pump and sending unit assembly. Remove fuel pump from assembly.

Installation (B2200 Carbureted With Electric Pump, B2200 PFI & B2600i)

Install new pump in sending unit assembly. Ensure fuel pump wire terminals do not touch hose clamps or bracket assembly. To complete installation, reverse removal procedure.

Removal (Miata, Protege, RX7 & 323)

1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE.

2) On Miata, remove rear package trim (behind seat). On Protege and 323, remove rear seat. On RX7, remove carpet in luggage compartment.

3) On all models, remove fuel pump access cover. Disconnect fuel hoses and electrical connector. Remove fuel pump and sending unit assembly. Remove fuel pump from assembly.

Installation (Miata, Protege, RX7 & 323)

1) Install fuel pump to assembly using NEW "O" ring, cap and spacer between fuel pump and outlet pipe (coat components with oil or gasoline before installing). See Fig. 23. After installing fuel pump to assembly, blow through outlet pipe (at top of assembly) toward pump to confirm sealing of "O" ring.

2) If air flows through pump, shake pump several times to dislodge check ball. To complete installation, reverse removal procedure.

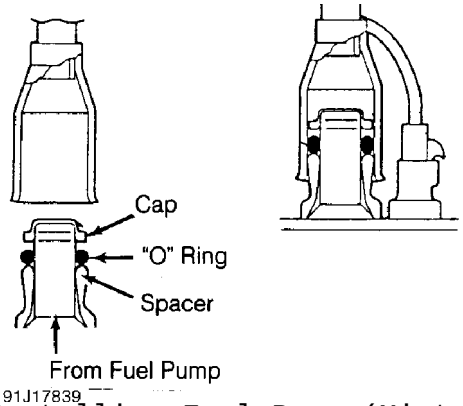


Fig. 23: Installing Fuel Pump (Miata, Protege, RX7 & 323)
Courtesy of Mazda Motors Corp.

Removal (MPV & MX-3)
1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Remove rear seat. On MPV, lift rear floor mat.
2) On all models, remove fuel pump cover. Disconnect fuel hoses and electrical connector. Remove fuel pump and sending unit assembly. Remove fuel pump from assembly.

Installation (MPV & MX-3)
1) Replace fuel hose between pump and outlet pipe (DO NOT apply excessive force when installing onto pump nipple). Install hose clamps.
2) Install pump with wire terminals positioned to avoid contact with metal parts. To complete installation, reverse removal procedure.

Removal (MX-6 & 626)
Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Remove fuel tank. Turn lock ring counterclockwise. Remove lock ring. Remove fuel pump and sending unit assembly.

Installation (MX-6 & 626)
Clean seal area on tank and assembly flange. Lightly coat NEW "O" ring with molybdenum grease. Install seal in groove. Carefully install assembly into fuel tank, ensuring filter is not damaged and seal remains in groove. Install and turn lock ring clockwise until tight. Install fuel tank.

Removal & Installation (929)
1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE.
2) Remove rear seat mounting bolts, located between seat bottom and seat back cushions. Remove seat cushions. Remove amplifier and CD changer (if equipped) and lift luggage compartment carpeting. Remove hole cover.
3) Disconnect fuel hoses and electrical connector. Remove fuel pump and sending unit assembly. Remove fuel pump from assembly. To install, reverse removal procedure.

Removal (Navajo)
Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Remove fuel tank. Using Fuel Tank Lock Ring Wrench (T86T-9275-A), turn lock ring counterclockwise. Remove lock ring. Remove fuel pump and sending unit assembly. Remove fuel pump from assembly.

Installation (Navajo)
Clean seal area on tank and assembly flange. Lightly coat NEW "O" ring with molybdenum grease. Install seal in groove. Carefully install assembly into fuel tank, ensuring filter is not damaged and seal remains in groove. Install and turn lock ring clockwise until tight using Fuel Tank Lock Ring Wrench (T86T-9275-A). Install fuel tank.

FUEL PRESSURE REGULATOR

CAUTION: After performing fuel system repairs, prime fuel system before starting engine. See FUEL SYSTEM PRIMING.

Removal & Installation (Except Navajo)

1) Disconnect negative battery cable. Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. On 929, remove dynamic chamber. On all models, disconnect vacuum and fuel hose(s) from regulator. Remove regulator mounting bolts. Remove regulator, gasket and "O" ring (if equipped).

2) To install, reverse removal procedure. Install NEW gasket and "O" ring (if equipped). On 929, install dynamic chamber with NEW gasket. Tighten bolts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

Removal & Installation (Navajo)

1) Disconnect negative battery cable. Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Disconnect vacuum hose from regulator. Disconnect fuel line coupling at regulator. See FUEL LINE CONNECTORS (NAVAJO).

2) Remove regulator mounting screws. Remove regulator, "O" ring and washer. To install, reverse removal procedure using NEW washer and "O" ring. Lubricate NEW "O" ring with light oil. DO NOT use silicone grease.

FUEL RAILS & INJECTORS

CAUTION: After performing fuel system repairs, prime fuel system before starting engine. See FUEL SYSTEM PRIMING.

Removal & Installation (B2200 PFI, B2600i & MPV 2.6L)

1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE under FUEL SYSTEM. Remove throttle body. See THROTTLE BODY under FUEL SYSTEM.

2) Remove support brackets and injector harness bracket from dynamic chamber. Disconnect vacuum hoses, PCV hose, intake air thermosensor connector and ground wire from dynamic chamber. Remove dynamic chamber.

3) Disconnect vacuum hose and fuel hoses from fuel rail. Disconnect injector electrical connectors. Pull fuel rail with injectors and pressure regulator upward to remove. Remove insulators, injectors and "O" rings from fuel rail.

4) To install, reverse removal procedure. Apply coat of engine oil to NEW "O" rings, and install rings on injectors. Install NEW insulators. Tighten fuel rail mounting bolts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article. Install dynamic chamber with NEW gasket.

Removal & Installation (Miata)

1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Disconnect negative battery cable. Remove air valve and PCV

valve hose from intake manifold. Disconnect vacuum and fuel hoses from fuel rail. Disconnect injector electrical connectors. Remove insulators, injectors and "O" rings from fuel rail.

2) To install, reverse removal procedure. Apply coat of engine oil to NEW "O" rings and install rings on injectors. Install NEW insulators. Tighten fuel rail mounting bolts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

Removal & Installation (MPV 3.0L)

1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Remove air intake tube. See Fig. 24. Remove throttle body. See THROTTLE BODY.

2) Remove intake air pipe, extension manifolds and upper intake manifold. Disconnect fuel hoses from fuel rail. Disconnect injector electrical connectors. Remove fuel rail and injectors as an assembly. Remove insulators, injectors and "O" rings from fuel rail.

3) To install, reverse removal procedure. Apply coat of engine oil to NEW "O" rings, and install rings on injectors. Install NEW insulators. Tighten fuel rail mounting nuts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article. Install NEW extension manifold and intake air pipe gaskets.

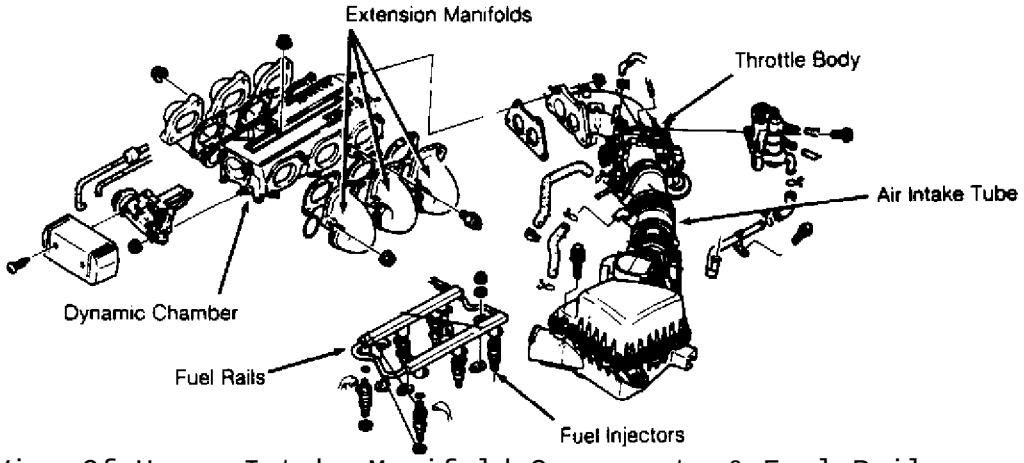


Fig. 24: View Of Upper Intake Manifold Components & Fuel Rail (MPV 3.0L)
Courtesy of Mazda Motors Corp.

Removal & Installation (MX-3 1.6L, MX-6 & 626 2.0L, Protege & 323)

1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Disconnect injector electrical connectors. Remove injector harness from fuel rail. Remove fuel rail mounting bolts. Remove fuel rail, injectors and pressure regulator as an assembly.

2) Remove insulators, injectors and "O" rings from fuel rail. To install, reverse removal procedure. Apply coat of engine oil to NEW "O" rings and install rings on injectors. Install NEW insulators. Tighten fuel rail mounting bolts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

Removal & Installation (MX-3 1.8L, MX-6 & 626 2.5L)

1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Disconnect negative battery cable. Remove air intake tube. Disconnect vacuum and fuel hoses from fuel rail. Disconnect injector electrical connectors. Remove fuel rail, injectors and pressure regulator as an assembly. Remove insulators, injectors and "O" rings from fuel rail.

2) To install, reverse removal procedure. Apply coat of engine oil to NEW "O" rings and install rings on injectors. Install NEW insulators. Tighten fuel rail mounting bolts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

Removal (Navajo)

1) Thoroughly clean engine. Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Disconnect negative battery cable. Remove upper intake manifold and throttle body as an assembly.

2) Disconnect fuel supply line from fuel supply manifold. See FUEL LINE CONNECTORS (NAVAJO). Disconnect fuel return line from fuel pressure regulator. Remove fuel supply manifold. See Fig. 25. Disconnect injector electrical connectors and retaining clips. Remove injectors from fuel supply manifold.

Installation (Navajo)

1) Lubricate NEW injector "O" rings with light oil. DO NOT use silicone grease. Carefully install injectors into fuel supply manifold. Carefully install fuel supply manifold into lower manifold using NEW manifold gasket.

2) Clean and oil fuel supply manifold bolt threads. Install fuel supply manifold bolts. Tighten bolts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article. To complete installation, reverse removal procedure.

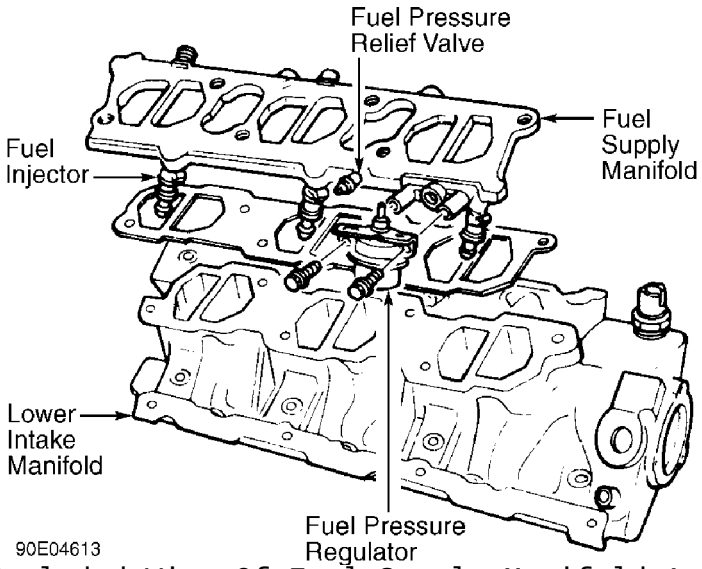


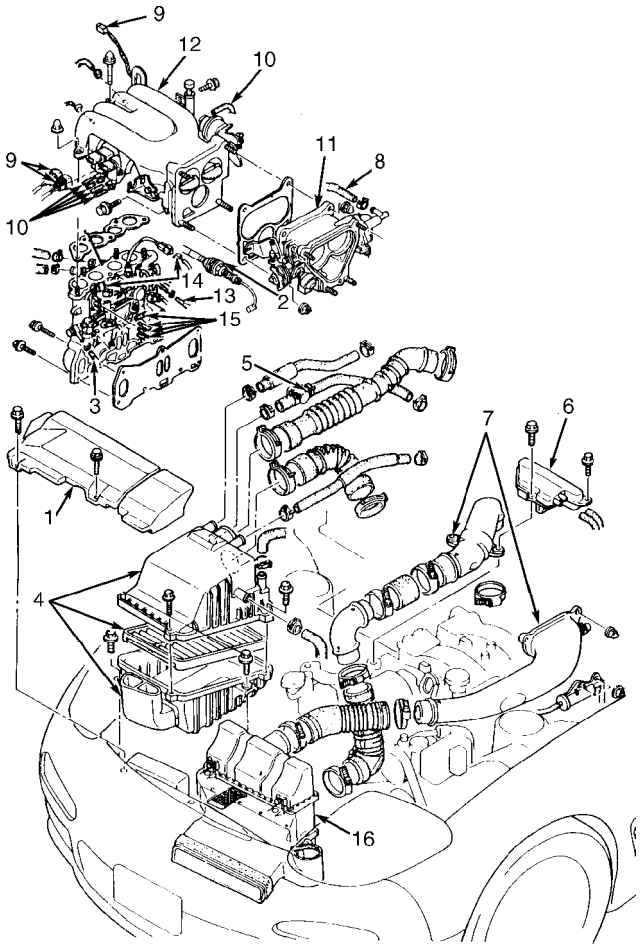
Fig. 25: Exploded View Of Fuel Supply Manifold Assembly (Navajo)
Courtesy of Ford Motor Co.

Removal & Installation (RX7)

1) Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Remove air intake duct. See Fig. 26. Remove throttle body. See THROTTLE BODY.

2) Remove upper intake manifold. Disconnect fuel hoses from fuel rail. Disconnect injector electrical connectors. Remove idle speed control solenoid. Remove fuel rail and injectors as an assembly. Remove insulators, injectors and "O" rings from fuel rail.

3) To install, reverse removal procedure. Apply coat of engine oil to NEW "O" rings, and install rings on injectors. Install NEW insulators. Tighten fuel rail mounting nuts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article. Install NEW manifold gaskets.



1. Fresh Air Duct
2. Throttle Cable
3. Intake Manifold
4. Air Cleaner
5. Air By-Pass Valve
6. Pressure Chamber
7. Air Intake Hose
8. Coolant Hose
9. Connector
10. Vacuum Hose
11. Throttle Body
12. Upper Intake Manifold
13. Fuel Hose
14. Connector
15. Vacuum Hose
16. Intercooler

93D79510

Fig. 26: Exploded View Of Air Intake System
Courtesy of Mazda Motors Corp.

Removal & Installation (929)

1) Disconnect negative battery cable. Release fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE. Remove dynamic chamber and throttle body as an assembly. Disconnect injector electrical connectors. Disconnect vacuum and fuel hoses. Remove fuel rail, injectors and pressure regulator as an assembly.

2) Remove insulators, injectors and "O" rings from fuel rail. To install, reverse removal procedure. Apply coat of engine oil to NEW "O" rings, and install rings on injectors. Install NEW insulators. Tighten fuel rail mounting bolts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

OXYGEN SENSOR

Removal

Disconnect oxygen sensor electrical connector. Sensor may be difficult to remove when engine temperature is less than 120øF (48øC). If sensor is difficult to remove, use rust penetrant to avoid damaging threads. Carefully remove sensor.

Installation

Apply anti-seize to sensor threads (if reusing old sensor or if new sensor is not coated with anti-seize). Install sensor and tighten to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article. Reconnect sensor electrical connector.

THROTTLE BODY

CAUTION: After performing fuel system repairs, prime fuel system before starting engine. See FUEL SYSTEM PRIMING.

Removal & Installation (Except Navajo)

1) On MPV 3.0L, drain about 2 qts. (1.9 L) of coolant from cooling system. On all models, disconnect negative battery cable. Remove air intake tubes.

2) Disconnect accelerator cable, coolant hoses and electrical connectors from throttle body as necessary. On 929, remove by-pass air control valve. On all models, remove throttle body. To install, reverse removal procedure using NEW throttle body gasket. See TORQUE SPECIFICATIONS TABLE at the end of this article.

Removal (Navajo)

1) Disconnect throttle position sensor electrical connector. Remove snow/ice shield to expose throttle linkage. Remove throttle cable bracket.

2) Disconnect cable from ball stud on throttle body. Remove air cleaner-to-throttle body air inlet tube. Disconnect canister purge hose from fitting beneath throttle body.

3) Remove 4 throttle body bolts. Remove throttle body from upper intake manifold.

Installation (Navajo)

Install NEW throttle body gasket. To complete installation, reverse removal procedure.

TURBOCHARGER

Removal (RX7)

1) Raise and support vehicle. Drain coolant. Disconnect negative battery cable. Remove air cleaner, intake air hoses and pressure chamber. See Fig. 26. Remove air control valve assembly. Disconnect vacuum hoses.

2) Remove drive belt and air injection pump. Disconnect oxygen sensor, exhaust downpipe and catalytic converter. Disconnect turbo control valve rod and actuator. See Fig. 27. Disconnect oil pipes from turbocharger. Remove coolant hoses.

3) Remove bolts securing turbocharger to exhaust manifold. Remove turbocharger assembly.

Installation (RX7)

Install turbocharger with NEW gaskets, "O" rings and exhaust manifold studs. Tighten nuts and bolts to specification. See Fig. 28. See TORQUE SPECIFICATIONS TABLE at the end of this article. To complete installation, reverse removal procedure. Prime oil system.

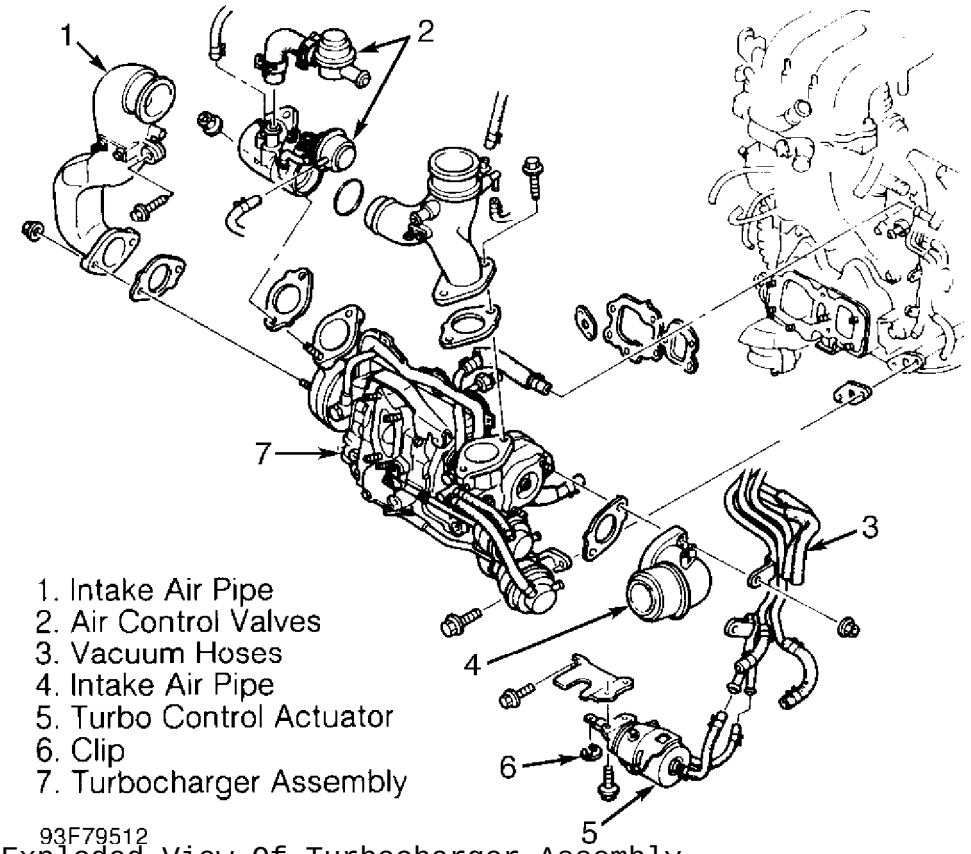
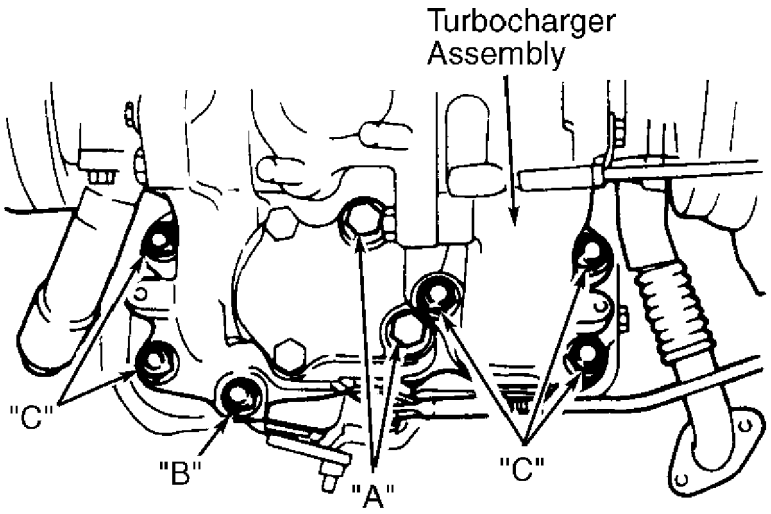


Fig. 27: Exploded View Of Turbocharger Assembly
Courtesy of Mazda Motors Corp.



"A" : Tighten To 28-38 Ft. Lbs (38-51 N.m)
"B" : Tighten To 16-21 Ft. Lbs (22-29 N.m)
"C" : Tighten To 32-42 Ft. Lbs (44-57 N.m)

93G79513
Fig. 28: Installing Turbocharger
Courtesy of Mazda Motors Corp.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Component	Ft. Lbs (N.m)
Crank Angle Sensor Mounting Bolt (Miata)	14-20 (19-27)
Distributor Mounting Bolts	14-18 (19-25)
Fuel Rail Mounting Bolt/Nut	14-18 (19-25)
Idle Pulley Bracket Bolts (MX-3 1.8L)	14-19 (19-26)
Oxygen Sensor	
B2200 Carbureted	(1)
Navajo	30 (41)
All Others	22-36 (30-49)
Throttle Body-To-Manifold Bolts	
(Except Navajo)	14-18 (19-25)
Turbo-To-Exhaust Manifold Bolts/Nuts (RX7)	
"A" Bolts (2)	28-38 (38-51)
"B" Nuts (2)	16-21 (22-29)
"C" Nuts (2)	32-42 (44-57)
Turbo-To-Exhaust Pipe Nut (RX7)	28-38 (38-52)
Upper Intake Manifold Bolt/Nut	
Except Navajo	14-18 (19-25)
Navajo	15-18 (20-24)
	INCH Lbs. (N.m)
Carburetor Mounting Nuts (B2200)	62-97 (7-11)

Crank Angle Sensor Mounting Bolt	
MX-3 1.8L, MX-6 2.5L & 626 2.5L	95 (10.7)
RX7 & 929	71-97 (8-11)
Crankshaft Position Sensor Bolts (Navajo)	79-106 (9-12)
Dipstick Pipe Bolts (MX-3 1.8L)	71-97 (8-11)
Fuel Pressure Regulator Bolts	71-97 (8-11)
Fuel Supply Manifold Bolts (Navajo)	89-124 (10-14)
Throttle Body-To-Manifold Bolts (Navajo)	71-106 (8-12)
Turbo Oil Return Pipe Nut (RX7)	71-97 (8-11)

(1) - Information is not available from manufacturer.
(2) - See Fig. 28 for nut/bolt identification.

END OF ARTICLE

P - EGR FUNCTION TESTING
Article Text

1993 Mazda RX7
For www.iluvmyrx7.com

Monday, August 20, 2001 07:19AM

ARTICLE BEGINNING

1989-95 ENGINE PERFORMANCE
Mazda EGR Function Testing

All Models

EGR VALVE

PISTON ENGINES (W/SINGLE OR DUAL VALVES)

1) Check vacuum lines for correct routing. Disconnect vacuum hose at EGR valve, and plug hose end. Connect vacuum pump to valve. Start engine. Apply 6-10 in. Hg to valve and hold.
2) Engine speed should drop at least 100 RPM or engine should stall. Vacuum should not drop more than one in. Hg in 30 seconds. Reconnect EGR vacuum hose.

Modulator Valve
Disconnect all vacuum and exhaust pipe hoses. Cap fitting going to each EGR control solenoid. Blow into bottom fitting from exhaust pipe end. Apply 7 in. Hg to fitting No. 3 (from ported vacuum source). Vacuum should hold until pressure at bottom fitting is released.

Vacuum Amplifier
1) Check for adequate manifold vacuum. With engine warm and at curb idle, connect vacuum gauge to vacuum amplifier port leading to EGR 3-way solenoid. Vacuum should not be more than 1.6-2.4 in. Hg at idle.
2) Disconnect venturi hose at carburetor. Increase engine speed to 3500 RPM. Vacuum should not change. Maintain high engine speed and reconnect carburetor venturi hose.
3) Vacuum gauge should read 3.2-3.8 in. Hg. Return engine to idle. Vacuum gauge should return to initial reading. If vacuum gauge does not return to initial reading, replace vacuum amplifier.

ROTARY ENGINE

Check vacuum hose routing. Disconnect EGR valve hose. Connect vacuum pump to EGR valve. Idle engine and apply 15 in. Hg. EGR valve stem/diaphragm should move and engine speed should drop at least 100 RPM or engine should stall.

EGR Solenoid Valve
1) Remove electrical connector from EGR solenoid valve (Gray dot). Remove vacuum hose at EGR valve. Connect a vacuum gauge to EGR vacuum hose. Warm engine to operating temperature.
2) Increase engine speed to 1100-3300 RPM. Vacuum gauge should not read any vacuum. Allow engine to idle. Apply 12 volts across EGR solenoid valve terminals. Increase engine speed again. Vacuum gauge should now read vacuum.

END OF ARTICLE